Polyethylene Terephthalate Plastics Recycling Facility (PETPRF)
Technical Standards & Appropriate Measures

Client: Enviroo Project Company Ltd

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[1] Introduction

[1.1] Report Objectives

This Technical Standards report has been produced to support the permit application for a plastic recycling facility (PRF). This document provides the operating techniques and evidence to demonstrate that the proposed activities at the PRF will be undertaken in accordance with the following guidance:

- Environment Agency. Non-hazardous and inert waste: appropriate measures for permitted facilities. Dated 8 December 2022.
- Best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council. 10 August 2018[1] .

BAT is only applicable to the operation of the proposed Wastewater Treatment Plant (WwTP). Not all aspects of BAT are applicable to the WwTP. A BAT assessment is provided at Section 10.

[1.2] Site Activities

Enviroo (the Operator) propose to accept up to 35,000 tonnes per annum of baled waste plastic for processing for recovery. The processing includes sorting, shredding, grinding, heating, washing and drying to create a plastic pellet product which meets end of waste criteria specifically food grade recycled polyethylene terephthalate (rPET) for the plastic manufacturing sector. Annual production of recycled plastic pellets is estimated at 17,500 tonnes. All activities will be within a new portal framed modular build warehouse with air extraction and treatment.

The plastic bales used in the process will be purchased from PRFs pre-sorted suppliers to ensure high PET content and minimum contamination. The plastic waste will be subject to sorting, at source and/or at a third-party materials recycling facility prior to receipt at the PRF and will be further segregated at the PRF.

The treatment includes screening and de-labelling, sorting and segregation, reduction in size and washing, flaking of PET material, drying and extrusion to a rPET product.

The treatment requires process water which will be treated onsite within a WwTP prior to discharge to surface water under appropriate consent.

[1.3] Site Location

The site is located at Plot 13 of Protos Plastic Park part of the wider Protos Recovery Park located at Ince Marshes. The recovery park covers an area of approximately 54 hectares with various waste and energy industries occupying plots. Adjacent plots comprise a glass bottle manufacturing plant, resource recovery facility and biomass facility. The plastic park will comprise various plastic recycling and recovery facilities and a plastic to hydrogen facility.

[1] COMMISSION IMPLEMENTING DECISION (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council

The site occupies an area of approximately 2.3 hectares and is located approximately 1.6km east of the town of Ince, and 1.1km northeast to the town of Elton, within a mixed industrial and semi-rural setting. The site address is Enviroo Project Co., Marsh Lane, Ince, CH2 4FP at approximate National Grid Reference 346508 376458.

The site lies at circa 8m AOD. There is a fall from west to east with the western boundary at approximately 9m AOD and the eastern boundary at 4.5m AOD. The northern boundary is formed by Marsh Lane, to the northwest is Protos Plot 10b and to the south a restricted byway (public right of way), which runs adjacent to Grinsome Road. The eastern boundary located approximately 20m from the restricted byway which links to Marsh Lane to the northeast of the site.

[1.4] Site Layout

Access is via Marsh Lane to the north of the site. The PRF building will comprise a portal framed modular warehouse building with a pitched roof approximately 170 m in length, 45 m in width and at its highest point will be 17.45 m.

A weighbridge and weighbridge office will be located adjacent to the site entrance to the north off Marsh Lane. All vehicles arriving will be expected to use this access at which point all duty of care documentation will be inspected and waste acceptance procedures undertaken as summarised in Section 3.

The PRF building will have five vehicular access doors, two on the northern aspect, one on the southern aspect and two on the western aspect to allow delivery of waste plastic and the export of rPET and waste materials. The site layout is shown on drawing reference 250064-WDK-XX-XX-D-A-0400 entitled Proposed Site Plan dated 21 May 2025. An extract of the site layout is provided below at Figure 1.

A feedstock area is to be located in a separate goods in / storage building to the west of the PRF building.

To the northwest of the site will be the WwTP. An extract of the WwTP layout is provided in Figure 2.

Figure 1 Site Layout

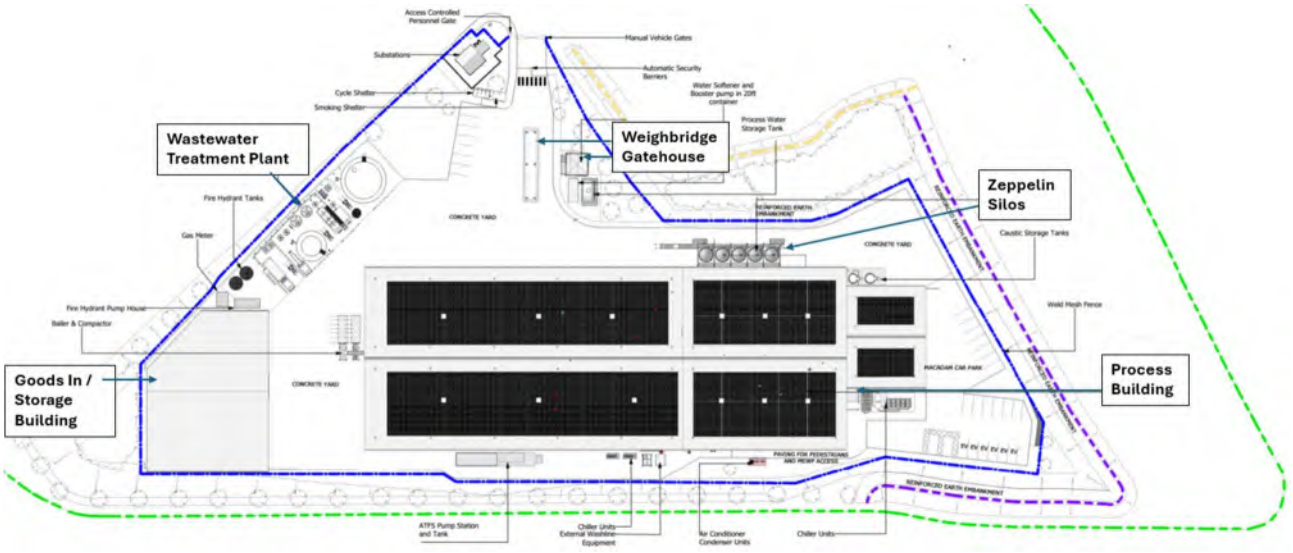
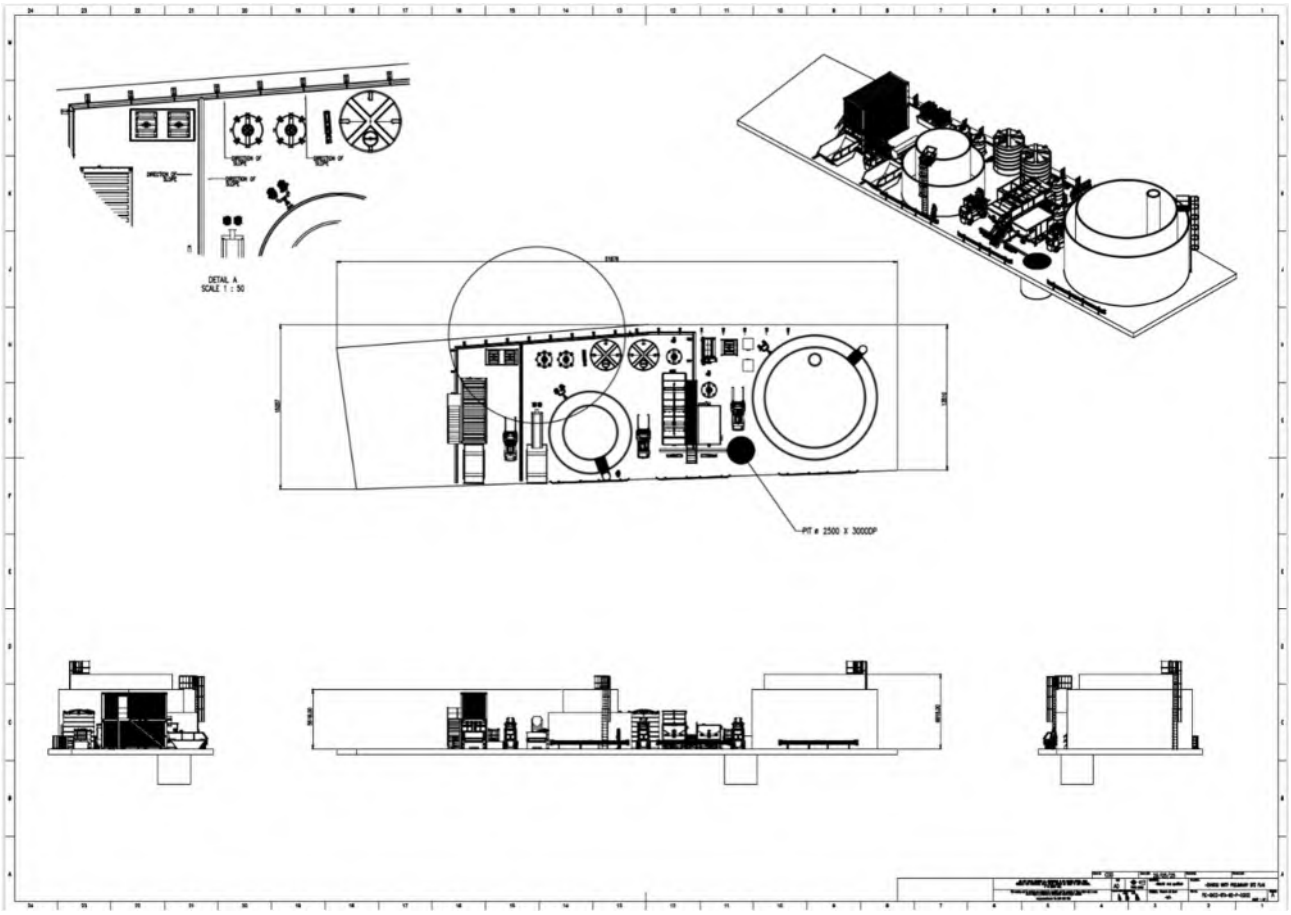


Figure 2 WwTP Layout



[1.5] Site Drainage

The Protos Recovery Park (PRP) Surface Waste Management Plan dated December 2023, submitted to discharge condition 23 of the PRP planning permission, describes the approach adopted to the strategic drainage scheme for the recovery park. The scheme includes provision for surface water flows from the wider recovery park and including Plot 13.

Site drainage will comprise two aspects, process water and surface water runoff from external hardstanding. All drainage is required to be discharged to surface water due to there being no sewer connections near the site.

The site's surface will comprise impermeable kerbed concrete hardstanding with sealed drainage that will collect surface water in a sealed drainage system. Surface water will pass through silt chambers designed to capture sediment and other pollutants and finally through a Class 1 Full Retention Separator prior to discharge off-site. This will comprise surface water runoff from the concrete hardstanding and roof runoff only.

Penstock valves will be in place to enable the surface water system to be isolated in the event of a pollution incident or fire. Surface water will be discharged into the surface water ditch which runs around the north, east and southern boundary of the site. This ditch is part of the larger PRP drainage network. The drainage ditches comprise culverts and form part of a network of main rivers and ordinary watercourses that form part of the Ince Marshes catchment and are drained by the

Environment Agency (Agency) operated surface water pumping station to the north of the site. The water in the drainage ditches eventually flow into the Mersey Estuary.

Process water used in the washing plant processes will be contained and pumped to the on-site WwTP prior to discharge to surface water. Two Package Treatment Plants (PTP) are to be installed to treat sewage from the site office and security office prior to discharge of the treated liquid effluent to surface water. The WwTP is discussed in Section 5.3 of this report and the supporting surface water risk assessment (Report Ref: K0419-AYE-R-ENV-00005).

[2] General Management Procedures

[2.1] Management System

The site will have an Environmental Management System (EMS) that incorporates the necessary features in Section 2 general management appropriate measures of the Agency Guidance such as plant / equipment maintenance.

[2.1.1] Operations and Maintenance

The EMS will contain a maintenance regime for all plant and equipment in accordance with manufacturers recommendations. Inspection and maintenance procedures are in place to ensure that all plant and equipment are operating as designed and are in good repair. All plant and equipment will receive annual Lifting Operations and Lifting Equipment Regulations (LOLER) and Provision and Use of Work Equipment Regulations (PUWER) inspections. Daily checks will be carried out on all mobile plant and any findings recorded in the site diary. Any defects that might harm the environment will be entered into the site incident management system.

The plant has been specifically designed to be fit for purpose. The design process included consideration of process hazards and a hazard assessment of possible chemical reactions prevention and protective measures.

All infrastructure used on site including vessels, pipes, tanks and connections will be resistant to materials used and stored on the site. Furthermore, they will not be used in a manner other than for which they designed, nor will they be used for a duration exceeding the specified design life. They will benefit from a daily inspection of integrity which will be undertaken by a technically competent member of staff. Labelling of process pipework will be undertaken.

In the event of plant and equipment failure, all impacted treatment activities will cease to allow investigation and repair. Repairs will be made immediately, if possible, with a temporary solution and where practicable afforded a permanent solution within a maximum of 7 working days. In the event that a satisfactory repair cannot be made and there is an opportunity for unabated emissions off site, activities will be suspended until a repair can be made, or new piece of equipment can be sourced.

The PRF process equipment is controlled by a Supervisory Control and Data Acquisition (SCADA) system which comprises networked data communications and graphical user interfaces providing high-level supervision of machines and process. This includes sensors and other alarms such as programmable logic controls which interface with process plant machinery and WwTP treatment facility. The SCADA control system provides alarm history and alarm configurations to inform maintenance and repairs of the equipment were identified and required.

[2.2] Staff competence

[2.2.1] Competence and Training

The appropriate measures' guidance requires the site to be operated by an adequate number of staff with appropriate qualifications and competence. All staff will have clearly defined roles and responsibilities. A training needs assessment will be undertaken to ensure each staff member undertakes appropriate training for their individual responsibilities. A training record will be kept up to date as part of the Quality Management System.

The Operator has decided to implement a Competent Management System (CMS) and will provide certificates when available. Site operations are to be overseen by a Technical Competent Manager (TCM) certified to the CMS.

[2.3] Accident Management Plan

Section 2.3 of the appropriate measure's guidance requires measures to be taken, where appropriate, to prevent events that may lead to an accident.

The site will have an Accident Management Plan (AMP) and procedures for incident reporting and investigation. The accident management plan requires a review of three key components:

- Identification of the hazards posed by the facility/activity.
- Assessment of the risks (hazard x probability) of accidents / incidents and their possible consequences; and
- Implementation of measures to reduce the risk of accidents and contingency plans for any accidents that do occur.

The AMP will be implemented and maintained for the site and associated activities and will be subject to reviews every two years or as soon as practicable after an incident or any changes to the activities and/or controls.

Procedures will be in place to address accidents / incidents and / or abnormal operations, along with reporting lines internally and externally, and timeframes for making reports or notifications. The relevant permit conditions for reporting requirements for accidental releases due to spillages or abnormal operating conditions will apply to the site. For specific risks i.e. Fire separate management plans have been produced.

[2.3.1] Hazard identification and prevention measures

There are a number of hazards that have been identified at the site:

- Incompatible wastes
- Security and vandalism
- Loss of containment
- Plant Failure
- Flooding

- Fire

Polluting substances proposed to be stored / may arise will comprise the following:

- Treatment Chemicals for water treatment plant
- Process water prior to treatment
- Emergency firefighting water

[2.3.1.1] Incompatible wastes

Strict waste acceptance criteria will be in place to ensure only baled plastic is accepted at the site. Any non-conforming waste will be either immediately rejected or quarantined prior to export to a suitably permitted facility.

[2.3.1.2] Security and vandalism

The site will have a number of security measures in place to limit the likelihood of arson or vandalism including:

- The site will operate 24/7 and therefore will always be manned excluding public holidays.
- Perimeter fencing is to be installed with a gated entrance.
- The PRF building will have lockable vehicle access doors and entrances.
- CCTV to be installed with full coverage external and internal. 360° cameras installed within PRF, and 180° cameras installed externally. Thermal cameras to be installed in goods in / storage building.
- Monitored alarm system for the PRF building.
- Inspection and maintenance procedures to check for any unauthorised access and/or damage.
- All visitors to sign in via weighbridge office.

[2.3.1.3] Loss of containment

All tanks and storage have been designed and to be installed in accordance with CIRIA guidance, “Containment systems for the prevention of pollution: secondary, tertiary and other measures for industrial and commercial premises” dated 2014 and associated regulations. Chemicals used in the process and in the WwTP are to be stored in bunded areas within the chemical store located to within the eastern section of the PRF building. This will ensure rainwater will not fill the containment bunds.

All containers and tanks associated with the WwTP will be bunded with a capacity of 110% to meet the requirements of CIRIA C736[2].

Loss of containment could lead to spillage and leakage of potentially contaminating liquids. Table 1 detail the chemicals to be stored on site.

Table 1 Potentially Contaminating Liquids - Chemicals

Materials	Use	Supplier	Estimate Quantity Stored (l)	Packaging
Caustic Soda 32%	Wash plant	Brenntag	13,000	IBC/ Bulk
MASTER S4 (wetting agent & foam control)	Wash plant	MCDermid	6,000	IBC
RP34 (detergent)	Wash plant	MCDermid	3,000	IBC
ANS TH (anti foam)	Wash plant	MCDermid	2,000	IBC
Sulphuric acid 15 - 51%	WwTP	Brenntag	5,000	Bulk
Polyaluminium chloride hydroxide	WwTP	Brenntag	5,000	Bulk
ACTIPOL DAM 3C5 (flocculant)	WwTP	Brenntag	4,000	IBC
Nutromex Plus 234a (Biological Nutriants)	WwTP	Omex	4,000	IBC
Lubrication oil	Maintenance	Fuchs	2,000	Drum

To prevent loss of containment and minimise the risk and impact of releases the following measures will be implemented in accordance with the requirements of CIRIA C736:

- Storage tank/container will be constructed to the appropriate British Standard and bunded to contain at least 110% of the volume of the tank/container.
- Transfer into designated bulk storage tanks will be via closed, hard piped or secure hose connections to minimise the risk of spills, vapour release or operator exposure.
- Dosing to the recycling process will be carried out using fixed, metered dosing pumps and sealed pipework, designed to deliver controlled quantities directly to the process without manual handling. Overfill protection, isolation valves and leak detection will be provided where necessary, and all loading and dosing operations will be undertaken by trained personnel following written operating procedures, with spill kits and emergency response measures readily available.
- Regular inspections of all storage tanks/containers for integrity and any signs of spillage.
- Immediate action to clear any spills using spill kits available in the PRF building.

[2] CIRIA. Containment systems for the prevention of pollution (C736F). June 2014

- Storage tanks/containers and site surfacing will be impermeable and resistant to the stored materials.
- Plant and equipment monitored via the SCADA control system will be subject to plant failure procedures.
- Pipework will be placed above ground or routed within bunded areas.
- In the event of a major spillage, which is causing or is likely to cause polluting emissions to the environment, immediate action will be taken to contain the spillage and prevent liquid from entering surface water or drains. Isolating chambers and penstock values will be in place to enable the surface water system to be isolated in the event of a pollution incident or fire. The spillage will be cleared immediately and placed in containers for offsite disposal, and the Agency will be informed.

The site's surface, drainage infrastructure, tanks and storage areas are to be subject to an inspection and maintenance programme. The inspection and any necessary maintenance required will be recorded. In the event that any damage breaches the integrity of the engineered containment so that it no longer meets the required standards, necessary remedial work will be completed immediately with a temporary solution, and a permanent solution will be implemented within 7 days. Any potential polluting substances subject to containment will be transferred or removed until containment has been rectified.

[2.3.1.4] Plant failure

The EMS will contain a maintenance regime for all plant and equipment in accordance with manufacturers recommendations. As detailed in Section 2.1.1 inspection and maintenance procedures are in place to ensure that all plant and equipment are operating as designed and are in good repair.

The PRF process equipment is to be controlled by a SCADA control system which includes sensors and other alarms such as programmable logic controls which interface with process plant machinery and the WwTP. The SCADA control system provides alarm history and alarm configurations to inform maintenance and repairs of the equipment were identified and required.

In the event of plant or equipment failure all impacted activities will be suspended until a temporary solution and/or permanent solution can be undertaken. Immediate repairs will be made for process critical plant and equipment where possible. In the event the activities require a prolonged period of suspension (over a working day) the contingency plan will be activated to effectively divert wastes from the facility until such a time activities may commence on repair of the plant and equipment.

[2.3.1.5] Flooding

The Flood Map supporting the planning application identifies that the site lies within a Flood Zone 3 which is defined as 'Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding'2. The flood map however identifies that the site benefits from flood defences and as such the probability of flooding is reduced. An assessment of flood risk for the site is contained within the Protos, Surface Water Management Plan dated 2018. The SWMP requires floor levels to be set at a minimum of 5.063m AOD and access roads set no lower than 4.763m AOD. The development platform level of the site is to be set at 6.45m AOD this is above the prescribed levels. It should also be noted that it is proposed to raise finished floor levels of the PRF building by 150mm above the surrounding hard standing to ensure that overland flow of water during storm events does not flood the building.

[2.3.1.6] Fire

A Fire Prevention Plan (FPP) (Report Ref: K0419-AYE-R-ENV-00007) has been prepared for the PRF which will form part of the EMS. A copy of the FPP is provided with this application.

The FPP has been prepared in accordance with the Agency's guidance for FPPs and details the required mitigation and management methods to prevent a fire of combustible materials stored on site. The information contained within the FPP aims to meet the 3 main Agency objectives:

- Minimise the likelihood of a fire happening;
- Aim for a fire to be extinguished within 4 hours; and
- Minimise the spread of fire within the site and to neighbouring sites.

The site accepts only baled plastic waste which is combustible. Combustible wastes after treatment requiring storage include reject plastic, labels, bottle caps and other incidental amounts of waste. These wastes will be stored within the goods in / storage building. The Operator proposes to install a comprehensive fire detection and fire suppression system within the buildings. This will comprise a four zone system using thermal fire detection cameras which are connected to four fire water cannon turrets which can be automatically activated in the event of a hotspot and/or fire. A firewater tank and associated pumps is proposed to be located to the south of the PRF building. The firewater tank would provide water supply to the automatic deluge system which would be installed within the buildings.

[2.4] Contingency plan and procedures

The site will have a Contingency Plan detailing procedures for permit compliance in the event of on-site maintenance, shut down or in the event of an accident. This comprises the above accident preventative measures to ensure critical infrastructure and plant are adequately maintained and appropriate spare parts are held.

The PRF is to be located within a wider plastics park which will be able to potentially accept diverted waste streams where possible in the event site operations are required to be temporarily suspended or cease.

Contingency procedures detail the actions to be taken by the site to inform suppliers and customers and arrange for diversion of wastes.

A list of approved suppliers is to be maintained as part of the EMS.

[2.5] Plant decommissioning

The site will have a decommissioning plan which will includes the following information:

- Site Plans showing drainage pipes and vessels.
- Methods for removal of the Plastic Recycling Facility Building
- Soil testing methodology on removal of site infrastructure.
- Clearing of deposited residues, waste and any contamination resulting from the waste treatment activities.

The above information is to be kept informing any future permit surrender to demonstrate that the Operator has protected land and groundwater during the lifetime of the site and that the land is in a satisfactory state on permit surrender.

[3] Waste pre-acceptance, acceptance and tracking

[3.1] Waste pre-acceptance

Prior to acceptance, waste pre-acceptance checks are undertaken. The following information is requested from the customer on enquiry:

- details of the waste producer including organisation name, address and contact details
- the specific source of the waste
- a description of the waste including its composition and quantity
- the List of Waste code (European Waste Classification, EWC, code).

The pre-acceptance procedures will ensure that the plastic bales are suitable for treatment. If considered to be required a visual inspection of the waste will be undertaken as part of the pre-acceptance checks.

[3.2] Waste acceptance

The PRF will be operational 24 hours a day, 7 days a week excluding public holidays.

The site will follow strict waste acceptance and rejection procedures ensuring that only conforming waste is accepted on site. All waste is accepted via the weighbridge. All wastes are weighed on arrival and duty of care documentation is inspected.

Vigilance will be exercised to ensure waste accepted is suitable, if a more detailed inspection of a load (for example because of detection of odour) is required the vehicle will be directed to the designated quarantine area where a more detailed inspection can be completed.

All inspections will be conducted by trained and competent staff adhering to site specific procedures and risk assessments.

If the load is found to contain non-conforming waste the Production and Quality Manager will decide whether the non-conforming waste can be removed without posing a risk to health and safety of staff and visitors and can be readily and safely separated. If this is the case, the portion of non-conforming waste will be segregated and rejected, and the remainder of the load will be processed.

As a further measure of quality compliance, an Enviroo appointed sampling technician will on a routine basis attend all suppliers. The technician will take representative fuel samples from waste streams bound for the PRF and ensure that the waste being sent is of the correct composition. Any issues found will be investigated. Any actions decided upon will be tracked by the EHS Manager.

All duty of care documentation is assessed and is to be stored electronically.

The plastic bales accepted at the site after weighing are delivered to the good in / storage building. The bales are offloaded by a forklift and stacked in the designated storage bay. An inspection of all waste is made during offloading.

The plastic bales would then be transferred by forklift truck to the PRF building for processing.

[3.3] Waste rejection

All waste is assessed on arrival to check and validate that is acceptable and is as described on the accompanying paperwork.

Should the waste be found not to conform during the initial visual inspection, then the details will be recorded, and the vehicle turned away.

If wastes have already been unloaded and deemed not to conform with the paperwork or are not permitted, then the waste will be:

- reloaded on to the delivery vehicle; or
- removed to a designated quarantine area as appropriate.

Records of non-compliant waste received at the site include details of:

- the quantity;
- characteristics;
- origin;
- delivery date and time; and
- the identity of the producer and carrier.

Waste will not be accepted unless the site has capacity. A waste tracking system is to be installed as detailed below in Section 3.4 and will allow the Operator to assess whether waste can continue to be accepted.

A record will be kept of all rejected wastes. In the event of non-conformance, the waste producer and the Agency will be notified.

[3.4] Waste tracking

Supervisory control and data acquisition (SCADA) control system is to be installed. This system will record capacities from weighbridge to silo and allow management of the waste at all stages including infeed ordering process, stock control and volumes of by product.

The integrated monitoring will allow the facility to monitor and manage capacity at all times and allow accurate reporting at any stage. This provides accurate waste tracking at all times.

[4] Waste Storage and Handling

[4.1] Storage Locations

The waste and final product storage arrangements will take place within the following areas.

- Goods in / storage building;
- Process Floor; and
- Extruder Hall.

All waste storage areas will be adequately signposted. The SCADA control system as stated in Section 3.4 will record capacities from weighbridge to silo and allow management of the waste at all stages including infeed ordering process, stock control and volumes of by product.

[4.1.1] Goods in / storage building

The covered goods in / storage building will be located to the northwest of the PRF building. The goods in / storage building store will comprise a purpose-built building with concrete hardstanding and sealed drainage. The outer walls will be constructed from pre-cast concrete whilst the inner walls constructed from concrete Legioblock. 6 bays are to be located in the building. These will be 3-sided and constructed from 80 cm thick Legioblock walls. Bales are to be stacked pending treatment in a designated storage bay. The bays will be constructed from pre-cast concrete blocks also up to 3.5 m in height. Bays 3 to 6 are to be used for feedstock. Bays 1 and 2 will be used for waste bale storage and for storage of other waste such as flake reject bags, caps and labels bags, extruder waste. The bays will have a capacity of up to 300 bales.

Due to operational requirements on site, the ‘first in, first out’ principle will not be applied. Bales of different grades of plastic will be blended to form the final products. Bales will be processed continually however a maximum storage time of 14 days is proposed in the event of plant maintenance and/or repairs.

[4.1.2] Non-target material storage

Non target material such as ferrous metals, labels, plastics, paper will be stored in small containers within the process floor. Non-target material storage will comprise the following storage as detailed in Table 2 below. Material will be stored temporarily in smaller storage containers such as skips and bulk bags and bulked for storage pending removal off site. Conveyors will transport certain non-target material externally. Waste will be stored for a maximum of 28 days however maximum storage times will be considerably reduced by the volume per day and storage capacity as well as the customer or onward recipient of the material.

Table 2 Waste Storage

Type	Process	Maximum storage volume internal (m^3)	External Storage Arrangement	Maximum storage duration (days)
Lump / Non Food Pellet / Contaminated Pellet / Unisensor Rejects / Flake Rejections / Air lifted fraction (big bag) / >40mm fraction (in bin) / West fines (batch wash / rinse tank) / Caps & Rings	Sorting / washline	2	Goods In / Storage Building Unnamed bay Size 343m^3 Capacity 215.6m^3	28
Dry fines >12mm / Dry fines <3mm / Flake Sort Dust	Sorting / washline	2	External 35m^3 Skip	28
Eddy Current Rejects / Non-Ferrous Metal	Sorting / washline	2	External 35m^3 Skip	28
Dust and labels aerodynamics / Residue / 2D and fines - ballistics	Sorting / washline	2	Covered compactor skip 35 m^3	28
Ferrous Metal / Baler Wire	Sorting	2	External 35m^3 Skip	28
Outbound BP Bale Store	Sorting / washline	N/A	Goods In / Storage Building Bay 1: Size 171.50m^3 Capacity 142.56 m^3	14
			Goods In / Storage Building Bay 2: Size 343m^3 Capacity 190.08 m^3	14
Inbound Feedstock	Feedstock	N/A	Goods In / Storage Building Bay 3: Size 402.5m^3 Capacity 224.64 m^3	14
			Goods In / Storage Building Bay 4: Size 402.5m^3 Capacity 224.64 m^3	14
			Goods In / Storage Building Bay 5: Size 402.5m^3 Capacity 224.64 m^3	14
			Goods In / Storage Building Bay 6: Size 402.5m^3 Capacity 224.64 m^3	14
Quarantine Area	N/A	N/A	Goods In / Storage Building Quarantine Bay Size 171.50m^3 Capacity 107.8m^3	28

[4.1.3] Final product storage

After treatment the final pelletised plastic product will either be automatically conveyed via a feed pipe to enclosed silos located external to the extruder hall; or stored in bulk bags on racking in the PRF building. A maximum of 200 bags will be stored in the PRF building.

Raw materials will either be stored at Position 1 (bulk storage near the extruder hall), Position 2 (chemical store near extruder hall), Position 3 (wash line dosing within the process floor), Position 4 (WwTP bulk storage) and Position 5 (WwTP dosing IBCs).

Table 3 Raw Materials Storage

Type	Storage Location	Storage Arrangement
Chemical Storage	Next to the extruder hall within PRF building	Containers will be bunded capable of containing at least 110% of the volume of the largest container within the bund.
2 x Chemical Storage Tanks	Process floor within PRF building and next to extruder hall.	Tanks will be bunded capable of containing at least 110% of the volume of chemical storage required.
Oil Storage	Workshops and maintenance buildings	Containers will be bunded capable of containing at least 110% of the volume of the largest container within the bund.

Storage areas and infrastructure will be regularly inspected in accordance with the site's EMS to ensure there is no loss of containment or spillages. Containment measures are provided in Section 2.3.1.3.

[4.2] Handling

Handling of the plastic bales will be limited to delivery into the goods in / storage building on acceptance at the PRF and transfer to the PRF building for treatment via forklift truck only. Only staff trained in the use of a forklift truck will be able to handle the waste.

Handling procedures will be provided for waste streams requiring specific handling procedures. This is relevant to the handling and transfer of the dry filter cake from the WwTP post sludge dewatering.

[5] Waste Treatment

[5.1] Waste Treatment – Waste types and activities

[5.1.1] Waste Accepted

The maximum amount of waste to be accepted per year will be 35,000 tonnes. Accepted plastic bales will be unloaded into the goods in / storage building pending treatment. Due to the source of the plastic bales from waste recycling facilities it is considered that the plastic will have been subject to separation and sorting however further sorting will be required to ensure the quality food grade specification rPET is achieved.

The following European Waste Catalogue (EWC) waste codes are to be accepted at the PETPRF as specified in Table 4.

Table 4 EWC Codes to be accepted at the PETPRF

EWC Code	Description
02	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING, FISHING, FOOD PREPARATION AND PROCESSING**
02 01	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 04	Waste plastics (except packaging)
07	**WASTES FROM ORGANIC CHEMICAL PROCESSES**
07 02	**wastes from the MFSU of plastics, synthetic rubber and man-made fibres**
07 02 13	waste plastic
12	**WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS**
12 01	**wastes from shaping and physical and mechanical surface treatment of metals and plastics**
12 01 05	plastic shavings and turnings
15	**WASTE PACKAGING, ABSORBANTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**
15 01	**packaging (including separately collected municipal packaging waste)**
15 01 02	plastic packaging
16	**WASTES NOT OTHERWISE SEPCIFIED IN THE LIST**
16 01	**End of life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end of life vehicles and vehicle maintenance**
16 01 19	Plastic
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTEWATER TREATMENT PLANTS AND THE PREPARATION OF WATER FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**
19 12	**wastes from the mechanical treatment of waste (e.g. sorting, crushing, compacting, pelletising) not otherwise specified**

EWC Code	Description
19 12 04	plastic and rubber wastes
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) SEPARATELY COLLECTED FRACTIONS (EXCEPT 15 01)**
20 01	**separately collected fractions (Except 15 01)**
20 01 39	plastics

[5.1.2] Waste Activities

The proposed activities and the corresponding Recovery (R)and Disposal (D) codes in Annex I and Annex II of Directive 2008/98/EC are presented in Table 5.

Table 5 Proposed activities

Activity reference	Activity listed in Schedule 1 of the EP regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity
AR1 – Wastewater Treatment Plant	S5.4 A(1)(a)(i) & S5.4 A(1)(a)(ii)	Effluent treatment: Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC concerning urban waste-water treatment — (i) biological treatment (ii) physico-chemical treatment D8 – Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations number D1 to D12. D9 - Physico-chemical treatment resulting in final compounds or mixtures which are discarded by any of the operations numbered D1 to D12, (e.g. evaporation, drying, calcination etc.) D15 - Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)	
Activity reference	**Description of activities for waste operations**		**Limits of specified activity**

Activity reference	Activity listed in Schedule 1 of the EP regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity
AR2 – Plastic Recycling Facility	• R5 Recycling/reclamation of other inorganic materials • R13 Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)		Physical treatment including manual and mechanical sorting, separation, screening, shredding, washing, granulation, extrusion and compaction of waste into different components for recovery. Subject to any other requirements of this permit wastes shall be stored for no longer than 1 year prior to disposal or 3 years prior to recovery.
Directly Associated activity			
AR3 – Effluent discharge		Discharge of effluent after treatment in AR1 D6 - Release into a water body, except seas/oceans	240 m^3/day
AR4 – Surface water discharge		Discharge of surface water runoff D6 - Release into a water body, except seas/oceans	

[5.2] Waste Treatment – Plastic Recycling Process

The PRF will operate 24 hours per day over 365 days of the year.

The plastic recycling treatment process comprises of the following processes:

- Pre-wash preparation and sorting and shredding
- Washing process
- Flake sorting process
- Extrusion and Solid State Polycondensation

The PET flakes would then be passed through two successive rising tanks. This removes remaining contaminants and the cleaning agents from the preceding washing stage. The PET flakes are also subject to further separation whereby the PET flakes sink and remaining foreign materials e.g. remnants of labels and bottle caps, float and are separated out.

The plastic recycling process is water intensive and process water will be recirculated and reused where possible. A portion of process water however will require treatment prior to discharge to

surface water. An on-site WwTP is to be installed. The WwTP treatment technologies proposed are detailed in Section 5.3.

[5.2.1] Pre-Wash Preparation and Sorting

The waste plastic received at the PRF is likely to have undergone sorting at third party waste management sites prior to baling. However, further sorting will be required prior to processing to deliver the high-quality food grade specification rPET. The pre-wash preparation and sorting involves the waste plastic being fed through a series of filters, magnets and sieves to remove metals, small particles, glass and remaining remnants of loose labels within the plastic bottle stream. This would include use of overband magnets, ballistic separators, sieves and eddy current separators. The process is summarised below.

Pre-Wash Preparation and Sorting – Process Flow

1. **De-wiring**
    - Bales loaded into a de-wiring unit.
    - Wires coiled and removed.
2. **Bale Breaking**
    - Bales fed into a bale breaker to separate bottles for sorting.
3. **Primary Size Reduction**
    - Plastic separated using a rotary shredder.
4. **Ferrous Metal Removal**
    - Overband magnet removes ferrous metals.
5. **Trommel Screening**
    - Separates paper, glass, organics, and other unwanted materials.
6. **Manual Sorting**
    - Hand-picking removes additional non-target materials.
7. **Non-Ferrous Metal Removal**
    - Eddy current separator removes non-ferrous metals.
8. **Wet Processing with Attrition**
    - Removes labels and surface contaminants.
9. **Near Infra-Red (NIR) Sorting**
    - Detects wavelength signatures to separate PET from HDPE, LDPE, PP, etc.
10. **Optical Colour Sorting**
    - Visible light + high-speed camera detect colours.
    - Air jets separate plastics by type and colour.
11. **Final Size Reduction**
    - Plastic shredded into uniform PET flakes.

12. **Final Quality Control**
    - Inspection and removal of non-food packaging and multi-layer trays.

The pre-wash preparation and sorting process will treat 4.5 tonnes per hour. This process will sort PET plastic into green, clear blue and clear for further processing. The pre-washed PET flakes would then be conveyed to a more intensive washing system. Labels, sleeves and other non-target materials are to be collected in storage bins.

[5.2.2] Washing Process

The PET flakes are washed within a friction washing unit. The washing process will remove contaminants from the plastic feedstock such as paper labels and residual liquids. This involves washing plastic within a rotating drum containing hot water and washing agents including caustic soda, detergents, flocculants and anti-foaming agents. The process is summarised below.

Washing Process – Process Flow

1. **Wet Granulation & Centrifuging**
    - rPET flakes undergo wet granulation.
    - Centrifuges remove excess water and loose contaminants.
2. **Air Separation**
    - Airflow removes residual label material.
3. **Hot Caustic Wash**
    - Removes glue, ink, and organic contamination.
4. **Float–Sink Separation**
    - HDPE/PP caps and floating fraction removed.
    - PET flakes sink; foreign materials float and are separated.
5. **Mechanical Drying & Centrifuging**
    - Removes surface water before thermal drying.
6. **Thermal Drying**
    - High-speed centrifugal spinner and fluid bed dryer reduce moisture content to target levels.
7. **Particle Size Management**
    - Screening ensures flakes are 8–12 mm.
    - Oversized particles are re-granulated.
    - Final de-dusting using air jets and baghouse filter systems.
8. **Homogenisation**
    - Mechanical blending in silos for uniform flake quality.

The washing plant will process up to 3.2 tonnes per hour of material prior to flake sorting.

[5.2.3] Flake Sorting Process

The flakes will be subject to a sorting process to remove non-target materials and flakes from the rPET flakes.

The final rPET Flake refinement and handling process is detailed below.

Flake Sorting Process – Process Flow

1. **Automatic Non-Ferrous Removal (>12 mm)**
   - Removes oversized non-ferrous contaminants
2. **Advanced Optical Sorting**
   - **Camera & NIR detection** – Identifies and removes non-target flakes based on spectral properties.
   - **Laser spectroscopy** – Detects chemical composition to remove remaining non-target flakes.
3. **Buffer Storage & Testing**
   - Flakes stored in 4 blending silos.
   - Samples tested in laboratory for compliance with specification.
4. **Final Allocation**
   - Accepted material sent to extrusion or packaging.
   - Excess flake packed for sale or used as feedstock during wash plant downtime.

3 tonnes per hour of material will be processed.

[5.2.4] Extrusion and Solid State Polycondensation – separate section of building.

The bagged flaked PET product would be transferred by forklift to the extruder. The extruder is used to transform the PET flakes into recycled PET pellets which can be exported to PET plastic manufacturers.

The extruder heats up the flakes in a rotating drum to produce a rPET resin and at the same time driving off any residual moisture within the flakes which could impact the quality and strength of the resultant rPET pellets. The pellets are produced under carefully controlled conditions within a vacuum environment to ensure production of high quality rPET, suitable for food manufacturing. The process involves passing the resin through a number of screens to ensure that there are no impurities introduced into the pelletised rPET. Additives are also introduced to deliver the required strength of the rPET, which may vary depending on the final application.

The rPET pellets would be subjected to further quality control tests and stored in bulk bags prior to dispatch.

The extrusion and solid state polycondensation process is detailed below.

Extrusion and solid state polycondensation process – Process Flow

1. **Automatic Feed**
   - Flakes automatically fed from buffer storage silos to the extrusion plant.
2. **Pre-Drying**
   - Vacuum drying in precompactor to remove moisture before melting.
3. **Extrusion**
   - Flakes melted, conveyed and pressurised.
4. **Melt Filtration**
   - Polymer melt filtered to 40 microns to remove contaminants.
   - Excess flake packed for sale or used as feedstock during wash plant downtime.
5. **Pelletising**
   - Melted Polymer formed into pellets and cooled.
6. **Vacunite SSP**
   - Pellets subjected to heat in an inert atmosphere for a given duration to increase the intrinsic viscosity to agreed specification.
7. **Final Blending & Quality Testing**
   - Flakes stored in 4 blending silos.
   - Samples tested in laboratory for compliance with specification.
8. **Packing & Dispatch**
   - Accepted pellets packed into silos or big bags for shipping to customers.

1.8 tonnes will be processed per hour.

[5.3] Wastewater treatment

There are no sewer connections at Protos Resource Recovery Park. Any process water is therefore required to be discharged to surface water. Appropriate treatment options have been considered and applied to the proposed WwTP.

The WwTP will be operational 7 days week, 24 hours per day.

The intention is that treated process water would be recycled to minimise the water use of the plant there would be a requirement to continually bleed out some of the recycled water and introduce fresh clean water to maintain the required parameters of the washing solution. In the first instance however all process water will be treated and discharged with a maximum predicted wastewater flow from the process will be 20 m^3/hour.

It is proposed to discharge approximately 240 m^3/day after treatment.

As the WwTP will treat and dispose of over 50 tonnes of effluent per day it is an activity that falls within Section 5.4 of Schedule 1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended), specifically:

Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC concerning urban waste-water treatment —

(i) biological treatment (S5.4 A(1)(a)(i))

(ii) physico-chemical treatment (S5.4 A(1)(a)(ii))

[5.3.1] Wastewater composition

The effluent to be treated (Table 6) is an organic bearing liquor. Process water from a similar PRF facility has been used to determine the required treatment techniques to be employed for the process water.

Table 6 Process Water Quality Influent to the Wastewater Treatment Plant

Parameter	Units	Predicted Wash Water Quality	
		Average	Maximum
pH		7.2	7.6
Conductivity	µS/cm	1,973	2,710
COD Total	mg/l	2,575	6,430
COD Filtered	mg/l	1,042	2,790
BOD5Total	mg/l	1,017	2,860
Suspended Solids	mg/l	1,113	2,860
TKN	mg/l	23	52
Total Nitrogen	mg/l	23	52
Ammonia (as N)	mg/l	16	40
Total Oxidisable Nitrogen	mg/l	0.7	0.7
Nitrate (as N)	mg/l	0.7	0.7
Nitrate (as NO_3)	mg/l	3	3
Total Phosphorous	mg/l	5	14
Ortho-Phosphate (as P)	mg/l	1	9
Ortho-Phosphate (PO4)	mg/l	4	26
Alkalinity (as $CaCO_3$)	mg/l	684	1,708
Alkalinity (as HCO_3)	mg/l	561	1,400
Chloride	mg/l	353	586
Sulphate	mg/l	20	64
Sodium	mg/l	315	458
Potassium	mg/l	30	44
Calcium	mg/l	113	164
Magnesium	mg/l	14	19
Silica	mg/l	10	27
Aluminium	mg/l	40	181
Iron	mg/l	6	14
Manganese	mg/l	0.2	0.4
Barium	mg/l	0.2	0.3
Boron	mg/l	0.2	0.2

The wastewater will be collected in a sump and pumped to the treatment plant.

The treatment plant comprises the following processes:

- Raw wastewater screening
- Inlet screening
- Flow and quality balancing
- DAF separation system
- Membrane Biological Reactor (MBR)
- Sludge dewatering for combing biological and DAF sludges

[5.3.2] Raw wastewater screening

A sand and grift separator will be installed within the PRF building prior to a collection sump to screen the wastewater. The separator will remove heavy particles from the wastewater prior to entry into WwTP to protect the plant and eliminate mineral components from wastewater. The screened wastewater will be collected in the collection sump, and any screened solids will be collected and contained within a storage bin.

[5.3.3] Inlet screening

An inlet screen comprising either a filter flat screen or rotating screen will prior to the buffer tank to remove plastic particles and fine sand sized or larger particles from wastewater to ensure plastic particles within the WwTP and reduce quantity in the wastewater. The screenings will be directed via a chute to a suitable collection bin.

[5.3.4] Flow and quality balancing & chemical dosing

The pre-screened wastewater will be transferred to a buffer tank. The buffer tank is to be installed with an integral mixer to allow dosing of water treatment chemicals, conditioning of flocs and to ensure that the flocs remain in suspension.

The tank is also where nonuniform wastewater is first collected and mixed in order to be pumped forward to the wastewater treatment system at a more uniform rate and homogenise wastewater composition.

To allow flow proportional addition of coagulant and flocculant into the buffer tank a chemical dosing container is to be installed. Each of the chemicals (acid, coagulant and polyelectrolyte) will be dosed by duty variable stroke rate dosing pumps. Chemically conditioned wastewater will then flow into the main flotation tank.

A sample point will be provided on the tank to allow the contents to be sampled and analysed. In addition, a pH /temperature monitoring instrument will be installed on the tank to monitor the contents.

Antifoam dosing will be provided at the tank to reduce the risk of foaming from the contents of detergents.

[5.3.5] DAF separation system

In a flotation system, micro air bubbles are introduced under pressure into the water flow to remove substances from the water by means of flotation. This is called DAF (Dissolved Air Flotation). Removal takes place by allowing small air bubbles to adhere to the contamination, after which it floats to the surface. A scraper is then used to remove the contaminants floating on top of the liquid. The formation and distribution of water and air, temperature and pH play an important role in this. This will reduce COD and BOD in the wastewater.

The contaminants scraped off the surface of the DAF will be pumped off to a sludge storage tank.

[5.3.6] Membrane Biological Reactor

The wastewater from the DAF will be transferred to a membrane biological reactor (MBR). An MBR consists of two parts: a bioreactor and a membrane installation. The biological processes that break down the pollution take place in the bioreactor (activated sludge). The membrane installation separates the water from the active sludge, after which it can be discharged or reused.

The separation of biomass from a clarified and treated wastewater is accomplished by a submerged filtration process, within an efficient ultrafiltration (UF) system.

This retains all biomass, and all suspended solids typically larger than about 0.02 µm, including all bacteria. The sludge will be pumped to the sludge storage tank.

[5.3.7] Reverse Osmosis

A Reverse Osmosis (RO) unit was originally proposed as an optional additional wastewater treatment technology.

RO, also called hyperfiltration, is mainly used to remove salts and minerals and therefore to reduce the conductivity. As stated in Section 5.3.1 the RO plant is not to be installed.

[5.3.8] Sludge dewatering

The sludge from the DAF unit will be dewatering via a filter press to squeeze as much water out of the sludge prior to disposal. This will create a dry filter cake that will be stored within a container prior to off-site disposal.

[5.3.9] Bunding

This section provides a description of the bunding arrangements for the process tanks within the proposed WwTP. All bunds are designed to meet 110% containment requirement for secondary containment and to achieve compliance with CIRIA C736 guidance for containment of hazardous liquids.

[5.3.9.1] Balance Tank Bund – 275 m³

The Balance Tank provides flow equalisation of incoming wastewater with variable solids load. It acts as the primary buffer between influent collection and biological treatment processes. The bund provides secondary containment for untreated wastewater with elevated suspended solids. Its primary functions are to:

- Prevent accidental release of raw or partially screened wastewater.
- Contain any leaks, overflows, or structural failures of the balance tank.
- Ensure that any high-pollutant influent cannot bypass treatment processes.

- Facilitate safe recovery and management of any captured liquid during maintenance or emergency response events.

The bund capacity of 275 m³ provides adequate containment for the tank volume.

[5.3.9.2] Combined Activated Sludge / Moving Bed Biofilm Reactor / Integrated Fixed-Film Activated Sludge - Bund 250m³

This tank houses the biological treatment stage, containing mixed liquor suspended solids (MLSS), biofilm media, and aerated wastewater used for organic and nutrient removal. The bund provides secondary containment for biologically active process liquor. Its functions include:

- Preventing environmental contamination from spills or loss of mixed liquor, which contains high biochemical oxygen demand (BOD), ammonia, and active biomass.
- Ensuring that loss of biological media or activated sludge does not reach surrounding land, drainage infrastructure, or watercourses.
- Allowing controlled recovery of spilled material during operational or structural failure events.
- Ensuring continued safe operation of the treatment process by preventing unplanned releases.

The bund volume of 250 m³ ensures adequate secondary containment for this biological process unit.

[5.3.9.3] Sludge Storage Tank Bund 1 – 45 m³

The sludge storage tank holds thickened sludge generated from the WWTP's primary and secondary treatment stages. This material has high solids content and is classified as a high-pollution-risk waste stream. This bund provides secondary containment for stored sludge. Key functions include:

- Preventing any escape of thickened sludge, which presents significant environmental hazards due to high nutrient, ammonia, organic load, and pathogen concentrations.
- Capturing any residual material during tanker loading, desludging operations, or equipment malfunction.
- Minimising potential for odour, nuisance, or contamination of land and groundwater.
- Providing a controlled recovery area in the event of leaks or structural tank failure.

The 45 m³ bund capacity offers sufficient containment for sludge handling activities associated with this tank.

All bunds listed above serve as secondary containment systems designed to meet the requirements of the permit and compliance with containment guidance (e.g., CIRIA C736).

[5.3.10] Wastewater Treatment Plant summary

A Process Flow Diagram (Enviroo PDF C1.0), a Control Narrative (J1413 – Enviroo WWTP) and Genco drawings are attached as Appendix A.

Table 7 Summary of Wastewater Treatment Plant

Item	Description	Comment
1	Sand and Grit Separator	To remove heavy particles from the wastewater prior to entry into WwTP. Purpose to protect WwTP and eliminate mineral components from biomass.

Item	Description	Comment
2	Filter flat screen or rotating screen to remove plastic particles and fine sand sized or larger particles from wastewater	To ensure that plastic particles do not enter WwTP and reduce concentration of plastics within biomass.
3	Buffer (Intermediate) Tank with integral mixer to allow dosing of water treatment chemicals, conditioning of flocs and to ensure that the flocs remain in suspension. Volume 50 to 60 m^3	To enhance recovery of suspending particles within DAF unit and reduce COD loading onto biological units.
4	Containerised Chemical Dosing Container (6m in length). To allow flow proportional addition of coagulant and flocculant into Intermediate Tank (Item 3)	Forklift truck access to allow for exchange of chemical vessels (1000 l IBC) and for storage of chemicals (4 m by 2m) required.
5	Dissolved Air Flotation (DAF) unit to recover suspended particles and floating oils from wastewater.	This unit will be sized to treat a flow rate of up to 25 m^3/h. As means of ensuring that unit is not undersized.
6	Membrane Biological Rector (MBR) for the aerobic biological treatment of the DAF effluent	These units are concrete tanks with submerged aeration diffusers and will be a permanent feature and cannot easily be removed from site
7	Sludge storage tank (Storage of Sludge from DAF Unit (Item 5)	
8	Sludge dewatering unit, to reduce moisture content of sludge and produce a dry filter cake.	Daily lorry access to allow removal of filter cake required.

It is considered that the key treatment stages are therefore:

1) The sand filter/screening stages to remove large particulates and solid detritus

2) The DAF to remove the recalcitrant organic content and small particulate organic matter

3) The MBR stage to

   a) convert ammonium to nitrate; as well as

   b) the removal of degradable dissolved organic matter

This non-degradable/suspended solids component will be separated via the sand filtration stage and the DAF stages of the treatment process, with the resulted separated component disposed of from site as a solid. The remaining degradable organic component is suitable for aerobic biological treatment. Treatment within a MBR system allows for a constant throughput of effluent into and out of the aerobic bioreactor as the ultrafiltration membrane retains the treatment biological solids, as well as any precipitates which form under the aerobic conditions. It is not considered likely that heavy metals, such as aluminium, iron and manganese etc) will persist through the process and that dissolved metals will precipitate either within the DAF system or in the bioreactor. In both cases the metals precipitated under the aerobic conditions will be removed as part of the solids management process.

The salt content of the liquor (e.g. sodium, chloride etc) are unlikely to be treated within a DAF or a MBR process.

The fourth Reverse Osmosis stage is not considered to be required, as the site is within a naturally saline environment, i.e. an estuarine setting and therefore there is not a further need to remove salts from the effluent.

A surface water risk assessment has been prepared for the discharge of treated effluent from the site (Report Ref: K0419-AYE-R-ENV-00005) amounting to 240 m^3/day. The emissions have been assessed using the SWRA tool and show the discharge is suitable to surface water.

On commissioning of the WwTP the treated effluent will be tankered off site for 3 months whilst this process is undertaken.

[5.4] Process control systems

The PRF and WwTP will be controlled via a SCADA system which comprises networked data communications and graphical user interfaces for high-level supervision of machines and processes. It also covers sensors and other devices, such as programmable logic controllers, which interface with PRF machinery and the WwTP. Process parameters will be monitored as part of the WwTP operation comprising pH, temperature, and conductivity via probes to allow rapid intervention and control.

All graphics, quality data, alarm history, and alarm configurations are synchronised in real-time and can be monitored and provide a management solution for the Production and Quality Manager.

The SCADA logs all other relevant information for maintenance and troubleshooting (composition, current, speed, and consumption) and allows facility management to follow the live data on graphic trends. Data archiving allows the facility to trace the history of the equipment that generates any halts in production. The real time data mitigates the risk of downtime and the historical analytics aids reporting and forecasting.

The SCADA control system will be monitored at all times by the Control Room supervisor to ensure all plant and equipment are operating effectively.

[6] Emission Control

[6.1] Overview

An Environmental Risk Assessment (ERA) (referenced: K0419-AYE-R-ENV-00004) has been submitted with this permit application and identifies the potential risks associated with the proposed activities onsite and their prevention through operational management. The appropriate measures in place to prevent and minimise fugitive emissions to air, including dust, mud, litter, odour, noise and vibration and point source emissions to air and water are detailed below.

[6.2] Fugitive Emission to Air

[6.2.1] Dust

The waste accepted at the site is limited to plastic bales which are not dusty. Therefore, dust emissions are likely to be limited to those generated by the processing activities and handling and storage of plastic flakes.

The waste types to be accepted, limited to baled waste plastic are unlikely to produce fugitive dust emissions. Storage and treatment are undertaken in an enclosed building(s). All plastic bales are delivered directly into the feedstock store. The plastic recycling process is to be undertaken within the PRF building. The doors are electrically operated roller shutter doors and are only opened for entry and exit.

The recycling process is either contained and/or utilises water limiting the potential for any liberation of particulates from the process. During treatment the granulation process is undertaken with water. Water is introduced at the granulation stage which will limit liberation of small particulates. During the rPET flake drying process the rPET flakes are to be dewatered in a high-speed centrifugal spinner and thermal drying using fluid bed dryer to reduce moisture content. A cyclone separator mixes the rPET flakes with cool air prior to transfer of the rPET to silos. A cyclone separator will ensure that any dust and fines are effectively removed.

Local exhaust ventilation systems are to be installed. Any fines and particulates that arise from the treatment will be contained via the extraction system to be installed. The proposed design comprises LEV1 serving the mechanical dust generation points of the shredder and sorting plant, and LEV2 a second system which includes the rPET melt and evaporate from the screen changer process areas. The extracted air will be drawn into a centralised ducting system and passed through a baghouse filter system prior to discharge to atmosphere. Both systems would minimise the emission of dust and particulates.

There would also be two flues from the natural gas boilers used to heat the process water.

The enclosed buildings are also ventilated to provide a safe working environment.

The EMS will contain a maintenance regime for all plant and equipment in accordance with manufacturers recommendations. Inspection and maintenance procedures are in place to ensure that all plant and equipment are operating as designed and are in good repair. The machinery and equipment will be maintained in line with the Operator's maintenance procedure. Daily checks will be carried out on all mobile plant and any findings recorded in the site diary. Any defects that might harm the environment will be entered into the site incident management system.

All buildings, equipment, plant and associated infrastructure will be inspected and maintained on a regular basis in accordance with the EMS. A leak detection and repair programme will be utilised to

identify and mitigate and potential fugitive emissions. Litter netting is to be installed on the external boundary fencing to prevent any windblown litter leaving site.

Processes that have the potential to create dust are contained and extracted via designated air extraction systems as discussed in section 6.3.

A complaints procedure is in place onsite, and all complaints and remedial action will be recorded in accordance with the site's EMS.

[6.2.2] Mud

The site is entirely concreted with sealed drainage with no internal unpaved roads or unmade ground. Traffic on the roads will be directed to and from entrance to the point of discharge or receipt of material. Waste types to be accepted are limited to plastic wastes. There is no expectation that mud emissions will occur.

A complaints procedure is in place on site, and all complaints and remedial action will be recorded in accordance with the site's EMS.

[6.2.3] Litter

Wastes to be accepted are limited to plastic bales. All storage and treatment will be undertaken within the feedstock store or PRF building which are to be fully enclosed and ventilated.

Local exhaust ventilation systems are to be installed. Any fines and particulates that arise from the treatment will be contained via the extraction system to be installed. The proposed design comprises LEV1 serving the mechanical dust generation points of the shredder and sorting plant, and LEV2 a second system which includes the rPET melt and evaporate from the screen changer process areas. The extracted air will be drawn into a centralised ducting system and passed through a baghouse filter system prior to discharge to atmosphere. Both systems would minimise the emission of dust and particulates.

Good housekeeping will also be employed including cleaning to minimise levels of any dust, fibre and loose material that may accumulate within the PRF building. This will be confirmed via daily inspections.

The vehicular access doors will remain shut and only opened for waste delivery and waste and material export. Litter netting is to be installed on the external boundary fencing to prevent any windblown litter leaving site.

However, a vigilant check of wastes delivered to site will be maintained to ensure that there are no traces of litter within the delivered materials. If litter is present onsite, either within the PRF building or externally, it will be collected by the end of the working day to avoid any off-site wind-blown litter.

[6.2.4] Odour

All incoming waste is subject to strict waste acceptance procedures. Within the PRF building deodorising equipment is to be installed to manage any potential odours that may arise.

Due to the design of the building structure, the enclosed processing activities and the nature of the waste feedstock materials stored and processed on site, there is very little potential for offsite odour emissions and impacts to arise from the site.

An Odour Management Plan (OMP) has been prepared which details the proposed control measures to be employed at the site to limit and control odour.

[6.3] Point Source Emissions to Air

[6.3.1] Local Exhaust Ventilation (LEV) system

Local exhaust ventilation (LEV) systems are to be installed within the PRF building to contain and abate fugitive emissions of dust specifically from the recycling process. LEV1 will be a 'Sorema' serving the mechanical dust generation points of the shredder and sorting plant. LEV2 will be a 'All controls' which includes the rPET melt and evaporate from the screen changer process areas. The extracted air will be drawn into a centralised ducting system and passed through a baghouse filter system prior to discharge to atmosphere.

A limit of 10 mg/m^3 of particulate matter is proposed as detailed in Section 7.1 emissions limits monitoring of this report.

[6.3.2] Boilers

Two low nitrogen oxides (NOx) natural gas fired steam generating boilers will provide onsite process heating, each with an individual net rated thermal input of 947 kWth.

The Medium Combustion Plant Directive (MCPD) only applies to combustion plant with a rated thermal input equal to or greater than 1MW but less than 50MW irrespective of the fuel used. An aggregated total rated thermal input is required for new MCPs. However, individual combustion plants with a rated thermal input less than 1 MW should not be considered for the purpose of calculating the total rated thermal input of a combination of combustion plants. As the sites plants are less than 1 MW and should not be aggregated, the MCPD does not apply.

The boilers will vent via 2 flue stacks located to the south of the PRF building. The wet steam from the boilers will be removed via a steam separator and will be sent to the WwTp for treatment.

[6.4] Emissions of Noise and Vibration

A NIA was undertaken by Noise and Vibration Consultants Ltd on 2nd October 2020 (Report Ref: R20.1001/DRK).

The NIA was undertaken in accordance with the following British Standards:

- BS4142: 2014+A1: 2019 'Methods for rating and assessing industrial and commercial sound'.
- BS5228-1: 2009+A1: 2014 'Code of practice for noise and vibration control on construction and open sites'.
- BS8233: 2014 'Guidance in sound insulation and noise reduction for buildings'.

The aim of the NIA was to provide information and advice on the following:

- Typical operating noise levels from the facility plant based on information from the Technology Providers.
- Typical background and residual sound levels at nearest sensitive receptors from noise monitoring data undertaken in November 2018 by Enzygo Environmental Consultants.
- Advise of any operations that are shown to exceed the appropriate and relevant noise criteria and where appropriate provide recommendations.

The sources of noise and vibration associated with the PRF comprise the plant and equipment within the PRF building.

The NIA stated that the results of noise predictions of the site determined by the construction of a noise model has shown the following:

- The noise prediction results show that the rating noise levels at the receptors shown to be between 6dB and 24dB below representative background sound levels
- The absolute noise levels predicted are well below sleep disturbance criteria based on WHO guidance (<40 dB LAeq) and within internal room levels with an open window according to BS8233: 2014 (external level of 50 Db LAeq daytime and 45 dB LAeq nighttime).
- Noise levels are predicted to be below the condition 25 noise limits from between 3 dB and 25 dB LAeq.

The NIA concluded that the proposed operation of the site would generate noise levels within relevant noise standards and guidance at nearest sensitive receptors.

Noise limits are applied in condition 25 of the Planning Permission 20/04396/FUL dated 12 May 2021. The condition states:

All operational noise emissions from the facility shall be controlled using individual plot boundary noise emissions limits to provide overall compliance with the following noise control objectives:

Table 8 Noise Limits

Noise sensitive receptor locations	Daytime noise levels Laeq(1hour) 0700 - 2300	Night-time noise levels Laeq(5mins) 2300 - 0700
Holme Farm	52	41
Station Road - North of Kemira Road	48	41
Duke of Wellington	40	35
Ince Orchards	45	41
Redwoods Drive, Elton	51	37

Reason: To limit the impact on the residential and local amenity and in the interest of protecting local amenity and to protect future amenity of other Plots.

The NVMP plan forms part of the sites Operating Techniques to control and manage noise.

The PRF will operate within a purpose-built building with cladding specifically for noise reduction to a maximum weighted sound reduction index Rw of 24 dB to achieve an external noise level not exceeding 70 dB LAeq 15 mins at 1 metre. In addition, the grinder used to flake the recycling plastic will be mounted within an acoustically treated enclosure.

[6.5] Point Source Emissions to Water (including Sewer)

Reference has been made to appropriate measures for point source emissions to water and sewer.

There are no point source emissions to sewer. There are no foul sewer connections on Protos and inquiries with United Utilities have confirmed the inability to connect to sewer. Any treated wastewater will be required to be discharged to surface water.

A surface water risk assessment has been prepared for the discharge of treated effluent from the site (Report Ref: K0419-AYE-R-ENV-00005) amounting to 240 m^3/day and for discharge from proposed PTPs to be installed amounting to 9.792 m^3/day. The emissions have been assessed using the SWRA tool and show the discharge is suitable to surface water. The following principles are to be applied to control emissions to water:

- water use should be minimised, and wastewater be reused where possible;
- contamination risk of process or surface water should be minimised; and
- where any potentially harmful materials are used, measures should be taken to prevent them entering the water circuit.

Goods in / storage building

The goods in / storage building will be fully enclosed covered building. Any surface water collected within the area will be directed to a 100m^3 attenuation tank before being transferred to the raw effluent sump. The runoff will then be pumped to the WwTP for treatment. The attenuation tank will benefit from a penstock isolation valve which will be closed as required.

PRF Building

The building benefits from impermeable surfacing throughout and will be fully contained, therefore ensuring that no process water can escape out of the PRF building.

Wastewater Treatment Plant

All tanks associated with the WwTP will be constructed to the appropriate British Standard and bunded to contain at least 110% of the volume of the tank/container meeting the requirements of CIRIA C736.Impervious surfacing which is resistant to material being stored is provided, with sealed construction joints within a bunded area with a capacity at least 110% of the largest vessel or 25% of the total tankage volume, whichever is the greater. The discharge from the WwTP will be limited to the treated effluent amounting to a maximum of 240 m^3/day and subject of the SWRA.

Package Treatment Plant

There will be two PTPs on site; one serving effluent from the security office positioned beside the northern perimeter, and one serving effluent from the primary building for site operations and which will be positioned in the south-eastern corner of the site.

The proposed PTP for the security office will be a Klargester BioTec+2, and the PTP for the primary buildings will be a Klargester BioTec+8 or similar. Both will handle only effluent from the toilet and kitchen areas of the security office and primary operations buildings. The BioTec+2 PTP is designed to process up to 1.92m3 per day, whilst the BioTec+8 is designed to process up to 7.872m3 per day. . Both PTPs will discharge to the same ditch that runs along the northern, eastern and southern

perimeters. The Klargester Biodiscs are manufactured to British Standard BS EN 12566-3[3], and will be operated in accordance with the manufacturers specifications such that all operations are in accordance with the British Standard.

The PTPs effectively treat sewage so that the liquid effluent can be safely discharged into surface water. The PTPs will have a combined flow of 9.792m^3/day. The discharge has been assessed as part of the SWRA. The PTPs will be operated separately.

[6.5.1] Point source emissions to water

There are no direct releases off-site other than via the engineered surface water drainage system, PTP discharge outfalls or via the WwTP. Three outfalls will connect to the drainage ditch system external to the site.

Outfall 1 will drain roof water from the southern aspect of the PRF building and from the goods in / storage building and treated liquid effluent from the PTP for the site offices to the southern ditch.

Outfall 2 will drain surface water runoff from the concrete hardstanding and roof water from the north of the PRF building via a full retention oil interceptor to the eastern ditch.

Outfall 3 will drain to the northern ditch and will comprise treated liquid effluent from the PTP for the security office, treated effluent from the WwTP and drainage from the sub-station pit comprising surface water only.

The outfalls will be fitted with precast headwalls and limited flow.

The site is to be located on impermeable reenforced concrete slab with sealed drainage, the entire perimeter of the slab is to be kerbed.

As stated above, in the PRF building all drainage will be collected via drainage channels and sump pits. A pumping station will pump any water in the collected sump pits and the process water to the WwTP. Externally all surface water from the concrete slab and roof water will be collected in a series of separate drainage channels and pipework. Surface water will pass through silt chambers designed to capture sediment and other pollutants and finally through a Full Retention Separator prior to discharge to surface water. Isolating chambers / penstock valves would also be included within the surface water drainage system to enable flows from the site to be isolated in the event of a major pollution incident / fire.

Surface water flows via the outfalls that are proposed to discharge into a surface water ditch that flows around the northern, eastern and southern boundary of the site. This ditch system forms part of the strategic drainage network developed for the consented Protos Recovery Park. The approved Protos Surface Waste Management Plan (dated December 2018) includes provision for surface water flows from the site. The surface water attenuation volumes provided for the plots, which includes Plot 13, are well in excess of the required volume to achieve greenfield runoff rates and also include an allowance for climate change. Surface water volume and quality is to be monitored as detailed in the SWRA.

A surface water risk assessment has been prepared for the discharge of treated wastewater from the site (Report Ref: K0419-AYE-R-ENV-00005) amounting to 240 m^3/day and the treated effluent from the PTPs amounting to approximately 9,792 litres per day (<9.792 m^3/day). It is proposed to

[3] British Standards Institute 2016, Small wastewater treatment systems for up to 50 PT. Part 3: Packaged and/or site assembled domestic wastewater treatment plants. BS EN 12566-3:2016

monitor the wastewater at the inlet to the WwTP and at the point of discharge from the WwTP to surface water. The proposed monitoring is provided in Section 7.2.

[6.6] Fugitive Emissions to Land and Water

The site is to be located on impermeable reenforced concrete slab with sealed drainage to a minimum depth of 340 mm. The entire perimeter of the slab is to be kerbed.

There are no direct releases off-site other than via the engineered surface water drainage systems or via the discharge from the WwTP as discussed above.

The tanks associated with the WwTP will have secondary containment in accordance with CIRIA C736.

All drainage infrastructures will be inspected daily and maintained and repaired as necessary.

For polluting substances comprising process water and treatment chemicals containment measures will be in place as detailed in Section 2.3.1.

- Impermeable to incidental rain fall.
- Sufficient strength to accommodate plant and equipment.
- Designed with kerbing so as to retain all incidental rainfall from predicted storm events taking account of increases in rainfall due to climate change and protect from any spillages or containment failures; and
- Designed with sealed joints where applicable and with sufficient falls so that collected surface water can only discharge to engineered sump(s).

[7] Emission Limits Monitoring

[7.1] Emissions to Air

As detailed in Section 6.3 two LEV systems are to be installed within the PRF building to contain and abate fugitive emissions of dust. Any process air discharged to atmosphere e.g. from the dust filtration unit, would pass through baghouse filter systems to remove particulate.

The design and installation of the LEV systems is to be confirmed on construction of the building and appropriate liaison with a specialist contractor prior to the commencement of any activities at the site.

Monitoring fugitive emissions of dust and particulates is not required as all activities are to be contained within a building subject to LEV systems. As stated in Section 6.3 the MCPD does not apply to the boilers.

Point source emissions monitoring to air proposed to be undertaken at the PRF is provided in Table 9 with the appropriate emission limit values.

Table 9 Point source emissions to air

Emission Point Reference	Source	Parameter	Emission Limit	Monitoring Frequency	Monitoring Standard
A1 Local Exhaust Ventilation (LEV) system	Dust Abatement Plant 1	Particulates	10 mg/m^{3*}	Once every year	EN 13284-1
A2 Local Exhaust Ventilation (LEV) system	Dust Abatement Plant 2	Particulates	10 mg/m^{3*}	Once every year	EN 13284-1

*Note: "EA limit (mg/Nm³) <10 mg/Nm³ (baghouse or cartridge filter) / EU BREF 'waste treatment' Table 6.3: BAT-associated emission level (BAT-AEL) for channelled dust emissions to air from the mechanical treatment of waste 2-5 mg/Nm³ 'Dust' (when a fabric filter is not applicable, the upper end of the range is 10 mg/Nm³).

The location of the emissions to air are shown in Appendix D.

[7.2] Emissions to Water

The site proposes to discharge surface water runoff and treated process water to surface water. A surface water risk assessment has been undertaken for the site.

This risk assessment demonstrates that there is a low potential to cause actual harm to the receiving River Mersey, the controlled waters receptor at the site.

Consequently, it is considered that the most appropriate mechanism for regulating the discharge is to set the conditions based on the surface water risk assessment:

- 300mg/l COD
- 60mg/l Total Nitrogen as the nitrogen content of the treated effluent will be in an inorganic nitrate form

The proposed emissions to water will be monitored for the following parameters as specified in Table 10:

Table 10 Point source emissions to water

Emission Point Reference	Source	Parameter	Emission Limit	Monitoring Frequency	Monitoring Standard
S1 Emission point to drainage ditch from WwTP	Treated effluent	pH COD Suspended solids Total Nitrogen	6-10 300 mg/l 60 mg/l 60 mg/l	Monthly	
S2 Emission Point to drainage ditch from surface water drainage	Surface water runoff	pH Suspended solids	No limits	Monthly	
S3 Package Treatment Plants	Package Treatment Plants	Visible sewage solids, sewage fungus, water discolouration, foaming or oil/grease will be observed	None	Monthly	

Additional monitoring will be undertaken at Sump inlet to the WwTP to validate and monitor wastewater composition.

The two PTP which are to be installed to treat sewage from the site office and security office prior to discharge to surface water will be visually monitored only. Visible sewage solids, sewage fungus, water discolouration, foaming or oil/grease will be observed, and none should be visible.

The location of the emissions to water are shown in Appendix E.

[8] Process Efficiency

The site will monitor and review the annual quantity of:

- water, energy and raw materials used; and
- residues and wastewater produced.

[8.1] Energy

An energy efficiency plan is to be developed as part of the EMS. The PRF has been designed to operate as energy efficient as possible with the use of electric mobile plant and equipment. The site will be operated in accordance with the requirements of ISO 50001: 2011, Energy Management System. Annual energy consumption will be reviewed as part of the EMS and an energy efficiency plan.

Energy usage will be reduced by regular maintenance of plant and equipment to ensure it is operating as designed and efficiently as possible specifically where heating is required.

[8.2] Water

The PRF process is water intensive. To manage this responsibly, the facility is designed with an integrated wastewater treatment system that is purpose-built and co-located on-site. The system consumes 10m^3/hour. It is proposed to discharge approximately 240 m^3/day.

The Operator will conduct monitoring of the annual consumption of water by recording all input, reused process water and wastewater to inform water use reduction. Monitoring is to be undertaken weekly of effluent composition pre and post treatment to inform additional reuse where possible. An inventory and tracking system will be kept of all water usage, wastewater generation and quality.

[8.3] Raw Materials

Use of raw materials and opportunities for substitution or minimisation will be considered as part of the Operators EMS. Chemicals are used as part of the PRF process and WwTP process. An inventory of raw materials is provided at Appendix C. A weekly review of chemical usage is undertaken to inform procurement of raw materials and assess potential reductions.

Wherever possible, raw materials will be selected that minimise environmental impact. Consideration will be given to such factors as degradability, bio-accumulation potential and toxicity. Reviews will be frequently undertaken to ensure that all raw materials are appropriate for use, that consumption is optimised and that opportunities for reduction and improvements are implemented.

[8.4] Wastewater

The PRF process is water intensive. To manage this responsibly, the facility is designed with an integrated wastewater treatment system that is purpose-built and co-located on-site. This system treats effluent from the manufacturing process, removing solids, chemicals, and organic matter. The design enables water reuse. Treated water is recycled back into the process, reducing freshwater demand. Any water that cannot be reused will be discharged in compliance with environmental regulations, ensuring minimal impact on local ecosystems. The system consumes 10m^3/hour. It is proposed to discharge approximately 240 m^3/day.

As the treatment system uses a 'dissolved air flotation' system which involves pumping fine air bubbles through the water. Suspended solids attach to the bubbles and are brought to the surface from where they are removed from the treated water. The removed solids would result in a sludge which would contain the contaminants removed from the washing effluent. This sludge would be disposed of to a suitable waste treatment facility.

[8.5] Process Residues

There are a number of potential waste products / residues resulting from the recycling process.

The screening and filtering of the incoming waste plastic could result in fines, waste plastics not suitable for PET recycling and metals. Non-target materials such as ferrous or non-ferrous metal, labels, HDPE/PP caps will be stored in dedicated storage containers for onward recycling, energy recovery or disposal.

Waste plastic discarded from the PET recycling process may be transferred to other facilities on the PRP site such as the Plastics to Hydrogen facility in order to reduce the volume of waste plastic sent for energy recovery or disposal.

Wastes arising from the process would be non-hazardous and would be collected within specifically allocated waste storage containers/tanks. The volume and type of waste would be recorded and removed from site by a licensed waste carrier.

Whilst as much of the treated process water as possible would be recycled to minimise the water use of the plant there would be a requirement to continually bleed out some of the recycled water and introduce fresh clean water to maintain the required parameters of the washing solution. The washing process results in the production of wastewater. Wastewater is collected and treated on site within the on-site WwTP. The management of wastewater at the site is discussed in Section 5.3.

The treatment process of wash water using the dissolved air flotation system results in suspended solids being removed resulting in a sludge. The sludge will contain the contaminants removed from the washing effluent. The sludge is to be dewatered to result in a dry filter cake. The filter cake will be disposed of to a suitable waste treatment facility. It is estimated that the sludge dewatering unit will annually (6.5 day per week operating period) produce circa 4,000 tonnes of filter cake.

[9] Waste Minimisation, Recovery and Disposal

The Operator will instigate effective waste management practices throughout the day to-day operation of their activities. This will include as a minimum:

- ongoing identification and implementation of waste prevention opportunities.
- the active participation and commitment of staff at all levels; and
- monitoring of materials' usage and reporting against key performance measures or benchmarks.

The following waste components will be produced through the treatment process. This comprises the following wastes:

- Wastewater sludge
- Off-specification plastic
- HDPE/PP Caps
- Labels
- Ferrous and non-ferrous metals
- Packaging

Waste minimisation through recycling and reuse is applied where possible. Waste will be removed from site by third-party contractors. A review of the best environmental management options for the waste streams generated will be carried out annually. Adjacent facilities part of the wider Plastics Park, such as the Plastics to Hydrogen Facility, is to be utilised to avoid incineration or disposal. Where required a review of any waste streams to be to landfill will be carried out every 2 years to explore viable alternatives. Records will be maintained to monitor the following characteristics of waste produced at site in addition to the Duty of Care where applicable:

- quantity nature and origin of the waste.
- the physical description of the waste.
- a description of the composition of the waste.
- any relevant hazardous properties (hazard and risk phrases).
- European Waste Catalogue code.
- handling precautions and substances with which it cannot be mixed; and
- disposal routes for each waste category.

[10] BAT Assessment for Wastewater Treatment Plant

BAT Assessment	Description	Comments
GENERAL BAT CONCLUSIONS		
Overall environmental performance		
BAT 1	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates features listed in I -XV	The Operator will have an accredited EMS (ISO 14001) comprising the features listed in BAT 1 I-XV. The Operator will have an Environmental Policy in place which states the commitment to legal compliance and continuous improvement. The EMS will include documented management procedures for all activities undertaken at the site.
BAT 2	In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given in a – g a) Waste characterisation and pre-acceptance procedures b) Waste acceptance procedures c) Waste tracking system d) Output quality management system e) Waste segregation f) Waste compatibility g) Sorting incoming waste	The site has formal waste pre-acceptance, acceptance procedures as detailed in Section 3. Waste acceptance procedures ensures all waste streams are segregated based on whether they are hazardous or non-hazardous and the contaminants present. As a further measure of quality compliance, an Enviroo appointed sampling technician will on a routine basis attend all suppliers. The technician will take representative fuel samples from waste streams bound for the PRF and ensure that the waste being sent is of the correct composition. Any issues found will be investigated. Any actions decided upon will be tracked by the EHS Manager. Supervisory control and data acquisition (SCADA) control system designed by Vertigo Solutions is to be installed. This system will record capacities from Weighbridge to Silo and allow management of the waste at all stages including infeed ordering process, stock control and volumes of by product. The integrated monitoring will allow the facility to monitor and manage capacity at all times and allow accurate reporting at any stage. This provides accurate waste tracking at all times. Quality control checks would be undertaken by the on-site appointed sampling technicians on both flaked PET product and PET pellets after extrusion. Quality control checks using laboratory testing will be undertaken on site ensure that the flaked product meets the required specification for the onward production of food grade PET resin pellets i.e. in accordance with Food Standards Authority (FSA) guidance. The recycled PET

BAT Assessment	Description	Comments
		pellets would be subjected to further quality control tests and stored in bulk bags prior to dispatch. The WwTP is to be fully automated therefore continually tracking the amount of process water being stored, treated,
BAT 3	In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of wastewater and waste gas streams, as part of the environmental management system (see BAT 1)	Process water is to be monitored in accordance with the proposed monitoring regime as detailed in Section 7.2 for the substances expected in the effluent from the washing process. Additional monitoring will be undertaken on installation and commissioning of the WwTP and will inform the emissions inventory. Emissions to air to be monitored at the site is limited to particulates from the LEV system to ensure that the LEV system is operating as designed. All records of any monitoring results are to be kept to form the emissions inventory as part of the EMS.
BAT 4	In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given in a. - d. a) Optimised storage location b) Adequate storage capacity c) Safe storage capacity d) Separate area for storage and handling of packaged hazardous waste	The site has been designed to utilise storage as safely and efficiently as possible. The WwTP is to be located to the north of the site. The WwTP will be located within a bunded area constructed to meet the requirements of CIRIA C736. In addition, all containers/tanks associated with the WwTP will be bunded with a capacity of at least 110% providing tertiary containment. All chemicals to be used in the washing process and the WwTP are to be stored either in the chemical store or within 2 chemical storage tanks to be located within the process floor as stated in Table 3.
BAT 5	In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.	Special handling and transfer procedures will be in place for the transfer of plastic bales from the delivery of plastic bales, transfer to the goods in / storage building, transfer from goods in / storage building to PRF building. Additional procedures will be in place for the handling and transfer of residual wastes from the PRF and the WwTP processes. All process water will be pumped and treated via a fully automated system requiring no handling or transfer of effluent by personnel.
Monitoring		
BAT 6	For relevant emissions to water as identified by the inventory of Wastewater streams (see BAT 3), BAT is to monitor key process parameters (e.g. Wastewater flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pre-	Process water and emissions to water is to be monitored in accordance with the monitoring regime as detailed in Section 7.2 which includes key process parameters at key locations pre and post treatment e.g. sump prior to transfer to WwTP (inlet) and outlet from WwTP. The information will be used to monitor the performance of the WwTP and inform any changes to the process water composition and required treatment

BAT Assessment	Description	Comments
	treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).	technologies. During commissioning of the WwTP it is proposed to monitor the process water at additional treatment stages of the WwTP after each technology to inform removal efficiencies and required technologies.
BAT 7	BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality	All monitoring undertaken on the point source emission to water is to be undertaken by an UKAS accredited laboratory. All monitoring is undertaken in accordance with EN standards where available or ISO, national or international standards where required. The proposed monitoring regime for the point source emission to water is provided in Section 7.2 and includes the requirements under BAT 7.
BAT 8	BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	Not applicable.
BAT 9	BAT is to monitor diffuse emissions of organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPs with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given in below: measurement, emissions factors, mass balance.	Not applicable.
BAT 10	BAT is to periodically monitor odour emissions.	Off-site olfactory monitoring will also be carried out with reference to the protocol in Appendix 1 of the Agency H4 Odour Management Guidance. Monitoring procedures are detailed in the sites OMP (Report Ref: K0419-AYE-R-ENV-00004).
BAT 11	BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and Wastewater, with a frequency of at least once per year	In accordance with the expected conditions of the Permit, water and energy usage will be required to be assessed and reported on an annual basis. Internal audits are undertaken in accordance with the EMS as detailed in Section 8.1 of this report. The WwTP has been installed to recover clean process water to reduce the sites water consumption. Treated wastewater will be reused in the process therefore significantly reducing the requirement for consumption of water. This in turn reduces the amount of Wastewater generated and subsequently requiring disposal.

BAT Assessment	Description	Comments
		Use of raw materials and opportunities for substitution or minimisation will be considered as part of Enviroo's EMS. Chemicals are used as part of the PRF process and WWTP process. An inventory of raw materials to be used at the WwTP is provided at Appendix C. A weekly review of chemical usage is to be undertaken to inform procurement of raw materials and assess potential reductions. Wherever possible, raw materials will be selected that minimise environmental impact. Consideration will be given to such factors as degradability, bio-accumulation potential and toxicity. Reviews will be frequently undertaken to ensure that all raw materials are appropriate for use, that consumption is optimised and that opportunities for reduction and improvements are implemented. Quality assurance systems in place maintain materials quality requirements and stock levels will be minimised as far as practicable, consistent with operational needs.
Emissions to air		
BAT 12	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1)	The site will have an OMP including the potential for odour emissions from the WwTP. The OMP will form part of the sites EMS and will be subject to regular review. Any amendments required to the OMP will be agreed with the Agency.
BAT 13	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of the techniques given in a. – c. a) Minimising residence times b) Using chemical treatment c) Optimising aerobic treatment	For the WwTP the treatment technologies to be employed limit odour generation of the process water. This is due to the fact the treatment technologies comprise both chemical treatment and aerobic treatment. The process water will be continually treated therefore minimising residence times. The DAF and biological sludges will be stored for no longer than 48 hours prior to dewatering.
BAT 14	In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given in a. – h. a) minimising the number of potential diffuse emission sources b) selection and use of high integrity equipment c) corrosion prevention d) containment, collection and treatment of diffuse emissions e) dampening f) maintenance	The WwTP is to be a fully contained process. Designed and installed by Logisticon using only high integrity equipment, constructed to prevent corrosion based on the chemicals used within the WwTP. The WwTP will be controlled via the SCADA control system with automatic alarms to inform maintenance and repairs of the equipment were identified and required.

BAT Assessment	Description	Comments
	g) cleaning of waste treatment and storage areas h) leak detection and repair programme	
BAT 15	BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g., start-ups, shutdowns) by using both of the techniques given in a. – b. a) Correct plant design b) Plant management	Not applicable to WwTP
BAT 16	In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use both of the techniques given in a. – b. a) Correct design of flaring devices b) Monitoring and recording as part of flare management	Not applicable to WwTP.
Noise and vibrations		
BAT 17	In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system (see BAT 1), that includes all of the elements contained in I – IV. I. Protocol containing actions / timelines II. Protocol for conducting noise and vibration monitoring III. Protocol for response to identified noise and vibration events e.g., complaints IV. A noise and vibration reduction programme	A Noise Impact Assessment (NIA) was undertaken by Noise and Vibration Consultants Ltd on 2nd October 2020 (Report Ref: R20.1001/DRK). The NIA shows noise, and vibration will not be an issue beyond the site boundary. A Noise and Vibration Management Plan (NVMP) (K0419-AYE-R-ENV-00006) has been prepared and will form part of the EMS. This comprises the procedures for control and reducing noise and vibration from the activities undertaken at the site. The NMP will be subject to regular review as part of the EMS. Any changes to the NMP will be agreed with the Agency. As part of the EMS the plant, infrastructure and equipment used on site will be subject to routine audits and replacements. Consideration is given to the reduction of noise and vibration with the replacement of plant and equipment. The PRF will operate within a purpose-built building with cladding specifically for noise reduction to a maximum weighted sound reduction index Rw of 24 dB to achieve an external noise level not exceeding 70 dB LAeq 15 mins at 1 metre. In addition, the grinder used to flake the recycling plastic will be mounted within an acoustically treated enclosure.
BAT 18	In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given in a. – e. a) Appropriate location of equipment and buildings b) Operational measures c) Low-noise equipment	Please see response to BAT 17.

BAT Assessment	Description	Comments
	d) Noise and vibration control equipment e) Noise attenuation	
Emissions to water		
BAT 19	In order to optimise water consumption, to reduce the volume of Wastewater generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given in a. – i. a) Water management b) Water recirculation c) Impermeable surface d) Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels e) Roofing of waste storage and treatment areas f) Segregation of water streams g) Adequate drainage infrastructure h) Design and maintenance provisions for detection and repair of leaks i) Appropriate buffer storage capacity	The following procedures and techniques are utilised at the site to optimise water consumption and reduce the volume of Wastewater generated. • Reuse / recirculation of all Wastewater where possible. • All sites surfaces comprise of bunded impermeable concrete hardstanding with sealed drainage. • Process water and clean surface water are to be segregated via separate drainage systems. • All waste storage and treatment will be undertaken within enclosed buildings. • The drainage systems are to be subject to maintenance and inspection procedures to allow detection and repair of any leaks. • Process water utilised in the washing process will be recirculated into the treatment process. The maximum predicted wastewater flow from the recycling process will be 30m^3/hour. The process will recycle/reuse the majority of the process water with approximately 5m^3 discharged for treatment and replenished with 5m^3 of raw water. It is proposed to discharge approximately 130 m^3/day a day. As the washing process is water intensive, optimising process water is integral in ensuring the treatment processes are financially viable. • Containment measures are provided in Section 2.3.1.3.
BAT 20	In order to reduce emissions to water, BAT is to treat Wastewater using an appropriate combination of techniques i.e., primary, physico-chemical and/or biological treatment.	The WwTP treatment technologies are provided in Section 5.3 and comprise a mix of primary, physico-chemical and biological treatment.
Emissions from accidents and incidents		
BAT 21	In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given in a. – c., as part of the accident management plan (see BAT 1) a) Protection measures b) Management of incidental / accidental emissions c) Incident / accident registration and assessment system	The site will have a formal structured Accident Management Plan (AMP) as part of their EMS addressing the requirements of Section 2.3 of appropriate measures guidance. Accident management requires a review of 3 key components: • Identification of the hazards posed by the facility/activity; • Assessment of the risks (hazard x probability) of accidents / incidents and their possible consequences; and

BAT Assessment	Description	Comments
		• Implementation of measures to reduce the risk of accidents and contingency plans for any accidents that do occur. Procedures will be in place to address accidents / incidents and/or abnormal operations, along with reporting lines internally and externally, and timeframes for making reports or notifications. Further detail of the AMP is provided in Section 2.3
Material efficiency		
BAT 22	In order to use materials efficiently, BAT is to substitute materials with waste.	Not applicable
Energy efficiency		
BAT 23	In order to use energy efficiently, BAT is to use both of the techniques given below. a) energy efficiency plan b) energy balance record	Energy and fuel used will be recorded at the site. Review of energy use and the potential for savings is one of the Objectives and Targets in the EMS and energy efficiency plan. Energy usage will be reported to the Agency on an annual basis in accordance with permit requirements. Further detail is provided at Section 8.1.
Reuse of packaging		
BAT 24	In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging, as part of the residues management plan (see BAT 1).	Any carboys, drums, bulk bags, IBC's, containers and pallets that may be reused will be reused where possible. The site will have a residues management plan which will form part of the sites EMS.
General BAT conclusions for the mechanical treatment of waste		
BAT 25	In order to reduce emissions to air of dust, and of particulate-bound metals, PCDD/F and dioxin like PCBs, BAT is to apply BAT 14d and to use one or a combination of the techniques given below: a) Cyclone b) Fabric Filter c) Wet Scrubbing d) Injection of water into the shredder	Not applicable.
BAT 26 - 28	BAT conclusions for the mechanical treatment in shredders of metal waste	Not applicable.
BAT 29 - 30	BAT conclusions for the treatment of WEEE containing VFCs and/or VHCs	Not applicable.
BAT 31	BAT conclusions for the mechanical treatment of waste with calorific value	Not applicable.
BAT 32	BAT conclusions for the mechanical treatment of WEEE containing mercury	Not applicable.

BAT Assessment	Description	Comments
General BAT conclusions for the biological treatment of waste		
BAT 33	In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input.	Not applicable.
BAT 34	In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H2S and NH3, BAT is to use one or a combination of the techniques given below: Adsorption, Biofilter, Fabric Filter, Thermal Oxidation, Wet Scrubbing	Not applicable.
BAT 35	In order to reduce the generation of Wastewater and to reduce water usage, BAT is to use all of the techniques given below: segregation of water streams, water recirculation and minimisation of the generation of leachate.	Not applicable.
BAT conclusions for the aerobic treatment of waste		
BAT 36	In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.	Not applicable.
BAT 37	In order to reduce diffuse emissions to air of dust, odour and bioaerosols from open-air treatment steps, BAT is to use one or both of the techniques given below: use of semipermeable membrane covers, adaptation of operations to the meteorological conditions	Not applicable.
BAT 38	BAT conclusions for the anaerobic treatment of waste.	Not applicable.
BAT 39	BAT conclusions for the mechanical biological treatment (MBT) of waste.	Not applicable.
BAT 40	In order to improve the overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures (see BAT 2).	See response to BAT 2 and BAT 33.

BAT Assessment	Description	Comments
BAT 41	In order to reduce emissions of dust, organic compounds and NH3 to air, BAT is to apply BAT 14d and to use one or a combination of the techniques given below: adsorption, biofilter, fabric filter, wet scrubbing	See response to BAT 34.
BAT 42 - 44	BAT conclusions for the treatment of waste oil	Not applicable.
BAT 45	BAT conclusions for the physico-chemical treatment of waste with calorific value	Not applicable.
BAT 46 - 47	BAT conclusions for the regeneration of spent solvents	Not applicable.
BAT 48 - 49	BAT conclusions for the thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil	Not applicable.
BAT conclusions for the water washing of excavated contaminated soil		
BAT 50	In order to reduce emissions of dust and organic compounds to air from the storage, handling, and washing steps, BAT is to apply BAT 14d and to use one or a combination of the techniques given below: adsorption, fabric filter and wet scrubbing	Not applicable.
BAT 51	BAT conclusions for the decontamination of equipment containing PCBs	Not applicable.
BAT 52 - 53	BAT conclusions for the treatment of water-based liquid waste	Not applicable.

Appendix A – WwTP

Enviroo WWTP.
Ellesmere Port, UK.
Control narrative.

	PRELIMINARY

Genco Water Ltd, 16A, Bryggen Road, North Lynn Ind Est, Kings Lynn, Norfolk PE30 2HZ.

Revision History

P&ID	Revision	Date	Remarks	Initials
J1414 – P&ID				OG

1. System Overview

This water treatment plant is designed to treat industrial wastewater using a combination of mechanical, physical, biological, and filtration processes. The plant comprises:

- Influent pit (raw water collection)
- Pre-screening unit (removal of large solids)
- Dissolved Air Flotation (DAF) unit (removal of suspended solids and FOG)
- Biological tank (degradation of organic contaminants)
- Post-FBR for separation of activated sludge.
- Sand filter for final polishing.

This Control narrative related to P&ID 'J1414 – P&ID – rev XX'

2. Process Control Sequence

2.1 Influent Pit Control (area 1000)

- Raw influent enters the inlet pit, where the level is continuously monitored.
- Duty/standby transfer pumps are controlled based on level:
    i. Start: High-level setpoint
    ii. Stop: Low-level setpoint
- Pumps operate duty standby.
- If level exceeds high-high limit, an alarm is triggered.

2.2 Pre-Screen Control (area 2000)

- Influent is pumped to a drum screen to be filtered <1mm.
- Screen operation is: screen run when influent pumps run, delay timer when influent pits stop

pumping.

- Screened solids are dispensed into a skip.
- Filtrate drops into catch tank.
- Catch tank pumps operate DOL duty/standby controlled by pressure level sensor with start/stop levels.
    i. Start: high-level setpoint – user definable
    ii. Stop: Low-level setpoint – user definable
- Faults: Motor overload, catch tank high level – generate alarms and may interlock the influent pumps.

2.3 Balance tank (area 3000)

- Screened effluent is pumped into effluent tank and level is monitored continuously via drop in hydrostatic level sensor.
- pH is measured to control the dosing of acid using pump 3000P0X
- Duty/standby pumps are controlled via level setpoints of the balance tank.
    i. Start: High-level setpoint – user definable
    ii. Stop: Low-level setpoint – user definable
- Duty/standby pumps are PID controlled to maintain a consistent flow setpoint user defined on HMI.
- Faults: Pump(s) tripped, High level, low level, pH alarm.

2.4 DAF (Pre-treatment) Control (area 4000)

- Flow to DAF is controlled by a VFD feed pump, based on setpoint.
- Coagulant and polymer dosing:
    i. Flow proportional dosing from inline flowmeter / smart controlled with DAFSense.
    ii. Manually adjustable setpoints from HMI.
- Recirculation Pump and Saturation Vessel:
    i. Recirculation water is saturated with air at 5–6 bar
    ii. Recirculation pump operates continuously during DAF operation
    iii. Air pressure regulated with control valve and monitored via pressure transmitter
- DAF Scraper:
    i. Operates on a timer (e.g., every 5 mins) to remove floated sludge
    ii. Interlocked with lid switch.
- Sludge hopper pump:
    i. Operates based on sludge compartment level.
- Turbidity sensor in outlet effluent tank (T4002) triggers alarm and potential recirculation if quality drops below setpoint.
- Effluent forward feed pump operated based on level in effluent tank.
    i. Start: High-level – user definable
    ii. Stop: Low-level – user definable
- Faults: Scraper trip, recirculation trip, low air pressure, low recirculation system pressure, sludge pump trip, high suspended solids.

2.5 Biological Tank Control (area 5000)

- Effluent pumped from T4002 to biological tank.
- Aeration/Mixing System:
    i. DO probe maintains target range (e.g., 2–4 mg/L) via PID control through PLC to blowers.
    ii. Blowers controlled via VFD.
- MLSS Monitoring:
    i. Sludge wasting controlled by MLSS setpoint or time-based logic
    ii. RAS sludge pumped to selector based on MLSS readings via FBR sludge pump/3port valve.
- Level Monitoring:
    i. Drop in hydrostatic level sensor providing 4-20mA signal to PLC.
    i. Inlet interlocked with tank level (to prevent overflow or starvation)
- FBR feed pumps from biological tank (T5001) to FBR.
    i. Flow setpoint controlled via PID and VFD.

2.6 FBR control (area 6000)

- Secondary FBR to follow the biological tank for removal of activated sludge.
- Functions similar to pre-DAF:
    i. Removes biological flocs or remaining solids
    ii. Operates based on downstream filter demand

2.7 AMF (Automatic Microfiber Filter) Control

- Filters are fed via DOL feed pump from T6001.
- Operation:
    i. Normally open during filtration
    ii. Backwash initiated based on:
        - Differential Backwash Timer (e.g., every 6 hours)
    iii. water sent to drain or back to inlet pit
- System interlocks:
    i. Feed pump shut down during backwash
    ii. Low feed pressure or backwash failure generates alarms
- Flow meter and turbidity sensor on AMF effluent monitor final water quality.

2.8 Poly make up unit (area 4100 & 6200)

- Level is measured in polymer make up tank via ultrasonic or pressure type
- Water valve opens based on level in tank
    i. Low level: Water valve opens
    ii. High level: Water valve closes

- Flow sensor reads incoming water flow via K1 flow meter.
- PLC reads digital inputs and converts into flow rate. When 30L water has been measured the 'neat' polymer pump turns on and doses for 'x' amount of time.
- Upon water valve opening, both mixers in chamber 1 and chamber 2 turn on DOL to mix polymer and stay on for 'x' amount of time after the water valve closes.
- Polymer dosing pump doses based on setpoint configurable on HMI.

#

3. Alarms and Interlocks

Component	Alarm/Interlock
Influent Pit	High-high/low-low level alarms, pump(s) fault
Pre-Screen	Motor fault / pump fault
DAF (Pre/Post)	Suspended solids high, air pressure low, scraper fail, recirculation pump fail, sludge pump fail, chemical pumps fail, forward feed pumps fail, pH low/high.
Biological Tank	DO low, mixer/blower fault, level high/low, MLSS high/low.
AMF Filter	DP high, backwash fail, flow low, pumps trip.
Chemical Dosing system	Low chemical level in tank(s), pump fault, pH high/low, poly make up fault.

All alarms are visible on the HMI with email/SMS alerts if connected to remote monitoring.

4. Operating Modes

- **Automatic Mode**:
  - All pumps, valves, blowers, mixers, and dosing systems operate based on sensor feedback and timers.
- **Manual Mode**:
  - Equipment can be operated individually for maintenance.
- **Emergency Stop**:
  - Stops all motors and closes valves.
  - Must be manually reset from HMI/panel.

5. HMI Interface

Operators can:

- View live status of each unit
- Adjust setpoints (timers, DO levels, start stop, flow rates etc)
- Acknowledge alarms
- View trends (DO, turbidity, flow, levels)

Genco Water Ltd
16A Bryggen Road,
Kings Lynn

Phone : 0845 388 7300
Fax :
E-mail : sales@gencowater.com
Internet: gencowater.com

P&ID

Project description: Wastewater treatment plant
Customer no.:
Drawing no.: 1.0
Order no.:
Project name: J1414 - Enviroo WWTP
Plant type:

Date: 16.05.25 Drawn by OG

Total project pages: 23

Status	Rev.	Date	Name	Date	Drawn by	Checked by	Standard
				16.05.25	OG		DIN 81346

Created for
Enviroo

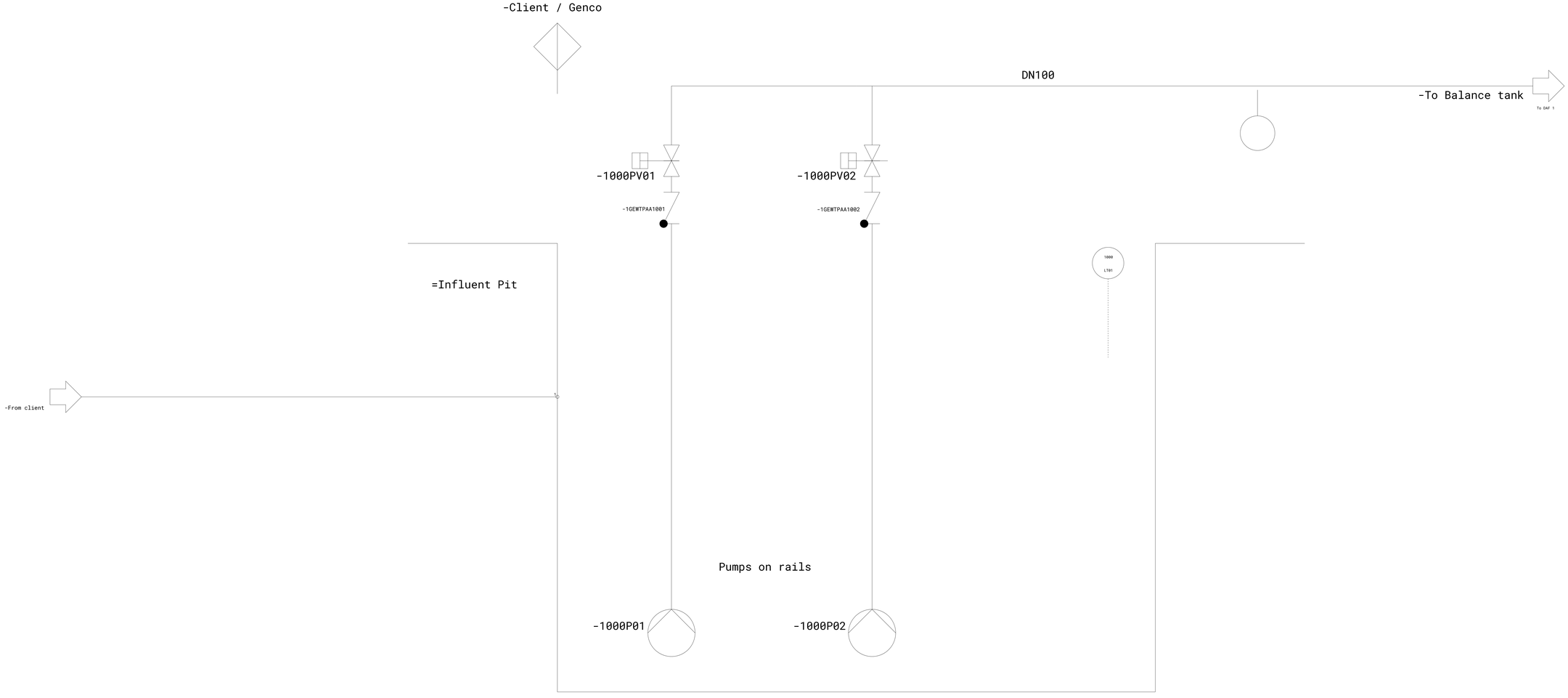
Ellesmere Port, Liverpool

Name

Drawing number 1.0

Scale 1:1

Sheet
Current 1
Previous
Next
Total number 1



Date	Name	Customer:	Sheet
		Enviroo	1
		Ellesmere Port, Liverpool	of 11
*			Scale 1:1
*			
Waste Water Plant			
GENCO		Influent pit	
		1.0	

-From influent pit

DN100

10 m3/h

0.55 kW

125 µm

Stainless-steel

-CDS-03

-2000M01

DN25

-2000SV01

DN25

-Potable water / reuse water

3

5

-Drum screen tank (2000T01)

4

2000
LT01

DN100

-2000MV01

-2000P01

-2000PV01

-2000MV02

-2000P02

-2000PV02

DN100

-To Balance Tank

Date	Name	Customer: Environ	Sheet 2
		Ellesmere Port, Liverpool	of 11
			Scale 1:1
Waste Water Plant		Primary screening	
GENCO		1.0	

To Balance Tank

-From drum screen

DN200

pH

3000
PH01

3000
M01

-Balance Tank (3000T01)

100m3
Stainless steel

-3000M01

DN80

-3000MV01

-3000P01

-3000PV01

-3000MV02

-3000P02

-3000PV02

DN50

-To floculator

Date	Name	Customer:	Sheet
		Enviroo	3
		Ellesmere Port, Liverpool	of 11
			Scale 1:1
Waste Water Plant			
GENCO		1.0	Balance Tank

-To sludge tank

4000
LS01

-4000M02
0.37kW

DN50

4000
PT01

-4000P07
1.5KW

-DAF 1

DN100

-1GEWTPAA4016

-1GEWTPAA4015

DN...

-To influent pit

-4000M01
0.37kW

-1GEWTPAA4013

-DAF 1 FFT (1GEWTPBB4002)

2.5m3

4200
LT01

4200
SS01

SUSPENDED SOLIDS

-4200MV01

-4200P01

-4200PV01
Bonomi

-To biological tank

-1GEWTPAA4014

-4000P06
5.5KW

-Compressed air

-Sample valve 2 floculaotr

-Sample valve 1 floculaotr

Floculator

-From balacnce tank

4000
FT01

-1GEWTPAA4004

-1GEWTPAA4003

-1GEWTPAA4002

-4000P03
H2s04
Grundfoss / Emec

-1GEWTPAA4001

-1GEWTPAA4008

-1GEWTPAA4007

-1GEWTPAA4006

-4000P04
Coagulant
Grundfoss / Emec

-1GEWTPAA4005

4000
PH01

-1GEWTPAA4012

-1GEWTPAA4011

-1GEWTPAA4010

-4000P05
Floculant Pump

-1GEWTPAA4009

=Control & Chemical Container

-4100MV01

-4100NV01

Potable water 32mm

-4100M01

-4100M02

1GEWTP
CF4002

S

-4100SV01

4100
LT01

1000 l/h
1.15kW
concentration
- 0.1 - 0.2%

-4100P01

Polymer mix station 1

Poly to floculator

Coagulant to floculator

Neutralizer to floculator

Date	Name	Customer:	Sheet
		Enviroo	4
		Ellesmere Port, Liverpool	of
			11
			Scale
Waste Water Plant			1:1

GENCO

DAF 1 & Chemical dosing

1.0

-Compressed air

16mm air line

Probe head air cleaning solenoid valves

VS

VS

VS

-5000SV03

-5000SV02

-5000SV01

5000 PH01

5000 SS01

5000 DO01

5000 LT01

pH

SS

DO

-From DAF 1 transfer tank

DN50

-Biological Tank (5000T01)

500 m3

-5000M01

-Aeration

-5000MV03

DN150

-To FBR

DN200????

-1GEWTPAP5001

Nutrient

Control & Chemical container

-5000M02

Blower Aerzen

-5000M03

Blower Aerzen

Date	Name	Customer:	Sheet
		Enviroo	5
		Ellesmere Port, Liverpool	of 11
			Scale 1:1
Waste Water Plant		Biological Tank	
GENCO		1.0	

DN80

-To Sludge Tank

DN80

-Return to Aeration tank

6000
LS01

PT1

-6000P04

-6000MV05

-6000M02

PT2

-6000P03

-6000MV04

-FBR 1 (6000T01)

DN150

-6000CV01

-From Bio Tank

DN80/DN150

-6000MV01

6000
FT01

-To influent pit

DN100

-6000MV02

-6000M01

-FBR 1 FFT (6200T01)

2.5m3

6200
LT01

6200
SS01

SUSPENDED SOLIDS

-6200MV01

-6200P01

-6200PV01

DN80

-To AMF

-6000MV03

-6000P02

-Compressed air

6100
FT01

S

-6100SV01

DN25

-6100MV01

-6100NV01

-Genco / Client

-Potable water

-6100M01

-6100M02

6100
LT01

1000 l/h
1.15kW
concentration
- 0.1 - 0.2%

-6100P01

Polymer mix station SLUDGE/FBR

-6100MV012

1" PVC hose

-6100MV03

-6000P01

1" PVC hose

-From Polymer IBC

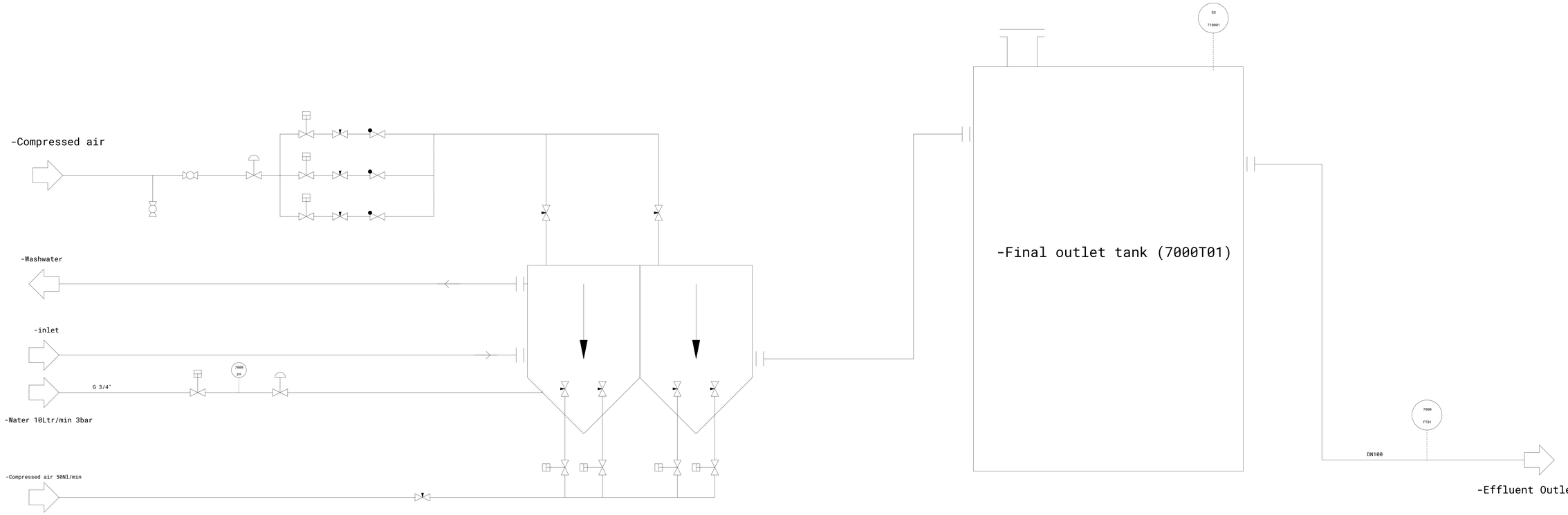
Date	Name	Customer:	Sheet
		Enviroo	6
		Ellesmere Port, Liverpool	of 11
-			Scale
*			1:1
Waste Water Plant			

GENCO

FBR 1 / Polymer mix 2

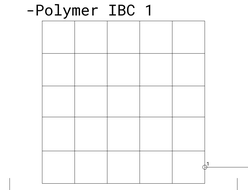
1.0

AMF



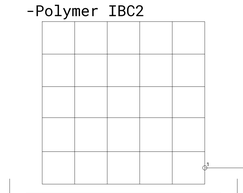
Date	Name	Customer:	Sheet
		Environo	7
		Ellesmere Port, Liverpool	of
			11
-			Scale
+			1:1
Waste Water Plant			
GENCO		Final Polishing / final outlet tank	
		1:8	

-Polymer IBC 1



-To 4100P01

-Polymer IBC2



-To 6100P01

-H2S04 storage tank (9100T01)

Enduramax 5000L

-9100MV01

-HS204 fill inlet

9100 LT01

-9100MV02

-9100MV03

-Coagulant storage tank (9200T01)

Enduramax 5000L

-9200MV01

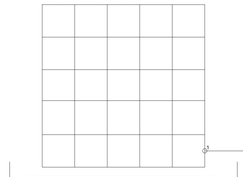
-Coag fill inlet

9200 LT01

-9200MV02

-9200MV03

-Nutrient IBC



-To Nutrient pump

-Bunded H2S04 chemical line

-Bunded coagulant chemical line

-To 4000P04

-To 4000P03

Date	Name	Customer:	Sheet
		Enviroo	8
		Ellesmere Port, Liverpool	of 11
			Scale 1:5

Waste Water Plant

GENCO

Chemical Storage

1.0

-8000M01

-DAF 1 sludge

-FBR 1 sludge

-Sludge Tank (8000T01)

20m3
Enduramaxx

8000
LT01

-8000MV01

-8000P01

8000
FT01

DN50

-8000MV03

-8000P02

-8000MV02

-8000M02

8000
LS01

-8000MV04

-8000M03

-Thickening bed
Genco

-Compressed air

Stainless steel shoot

-Dry solids to skip

8000
LA01

DN80

-Back to influent pit

Date	Name	Customer:	Sheet
		Enviroo	9
		Ellesmere Port, Liverpool	of 11
			Scale 1:1

Waste Water Plant

GENCO

1.0

Legend

Gate Valve

Ball valve

Solenoid Needle valve

Three port valve

Check valve

-Piston Actuator

S

-Solenoid Actuator

Centrifugal pump

Diaphram pump

Positive cavity pump

M

Motor gearbox (general)

Blower (general)

....
LT..

Level transmitter (analogue)

....
LS..

Level sensor (digital)

....
LT..

Flow transmitter (analogue)

....
PH..

pH measurement

....
SS..

Suspended solids / turbidity measurement

....
D0..

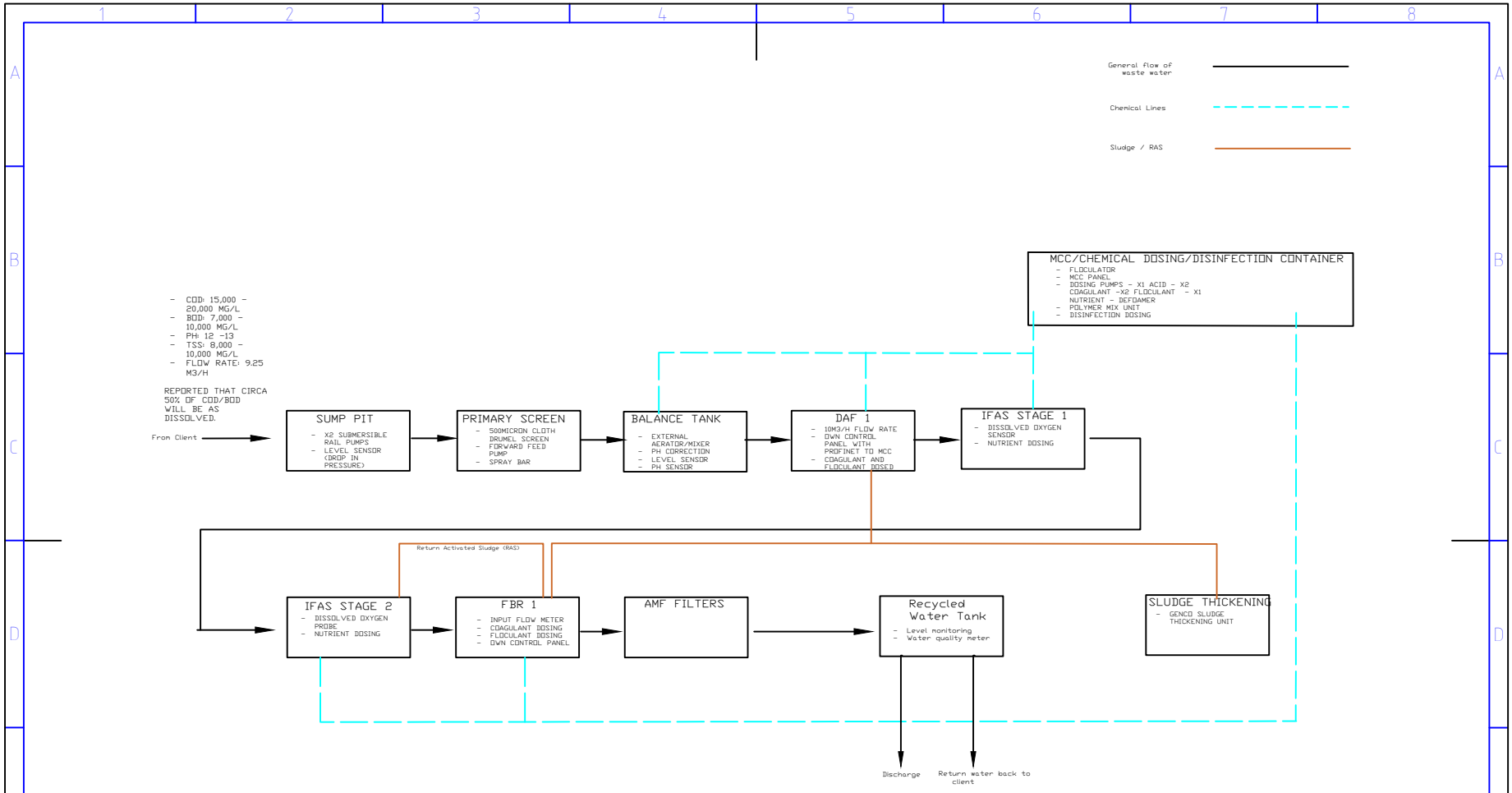
Dissolved oxygen measurement

....
LA..

Laser position sensor

Limitation of Genco scope (from client)

Date	Name	Customer: Enviroo	Sheet 10
		Ellesmere Port, Liverpool	of 11
-			Scale 1:1
-			
Waste Water Plant			
GENCO		1.0	

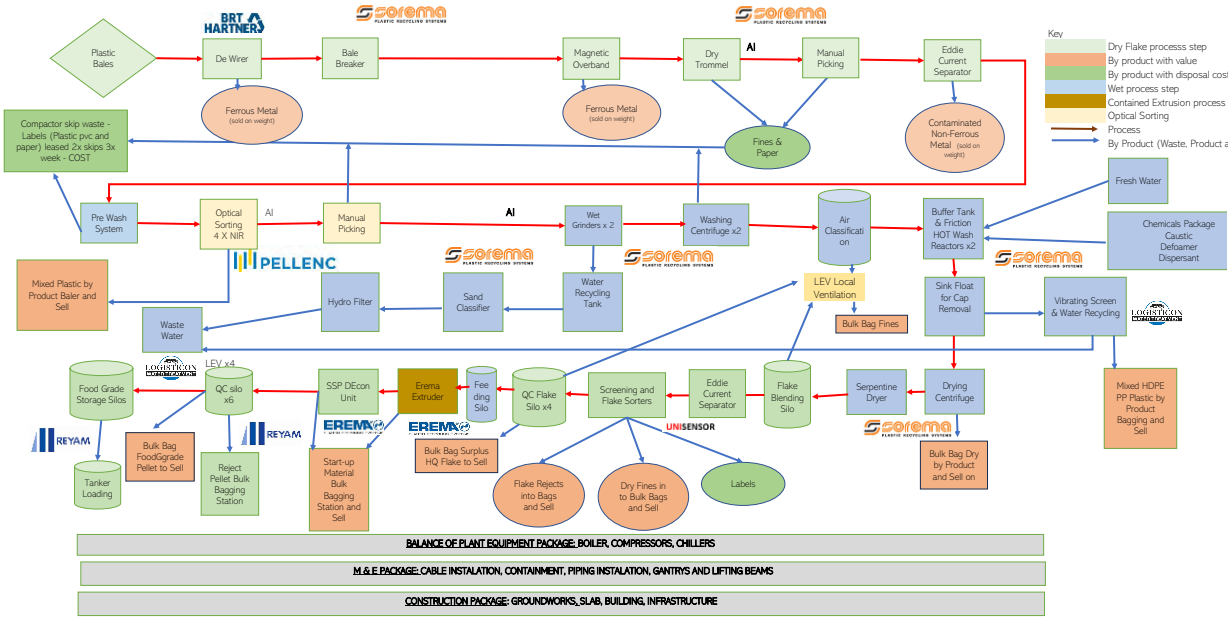


				SCALE	xxx5
			DATE	NAME	
			Edit 02/10/2024	OG	Process Flow Diagram
			Chec 00.00.00	xxx7	
					Enviroo WWTP
No:	Revision	Date	By	FILENAME	Enviro PFD V1.0

SHEETS 1

Appendix B – PETPRF

HIGH LEVEL PROCESS FLOW DIAGRAM



BALANCE OF PLANT EQUIPMENT PACKAGE: BOILER, COMPRESSORS, CHILLERS

M & E PACKAGE: CABLE INSTALATION, CONTAINMENT, PIPING INSTALATION, GANTRYS AND LIFTING BEAMS

CONSTRUCTION PACKAGE: GROUNDWORKS, SLAB, BUILDING, INFRASTRUCTURE

Appendix C - Inventory of Raw Materials

Chemical storage

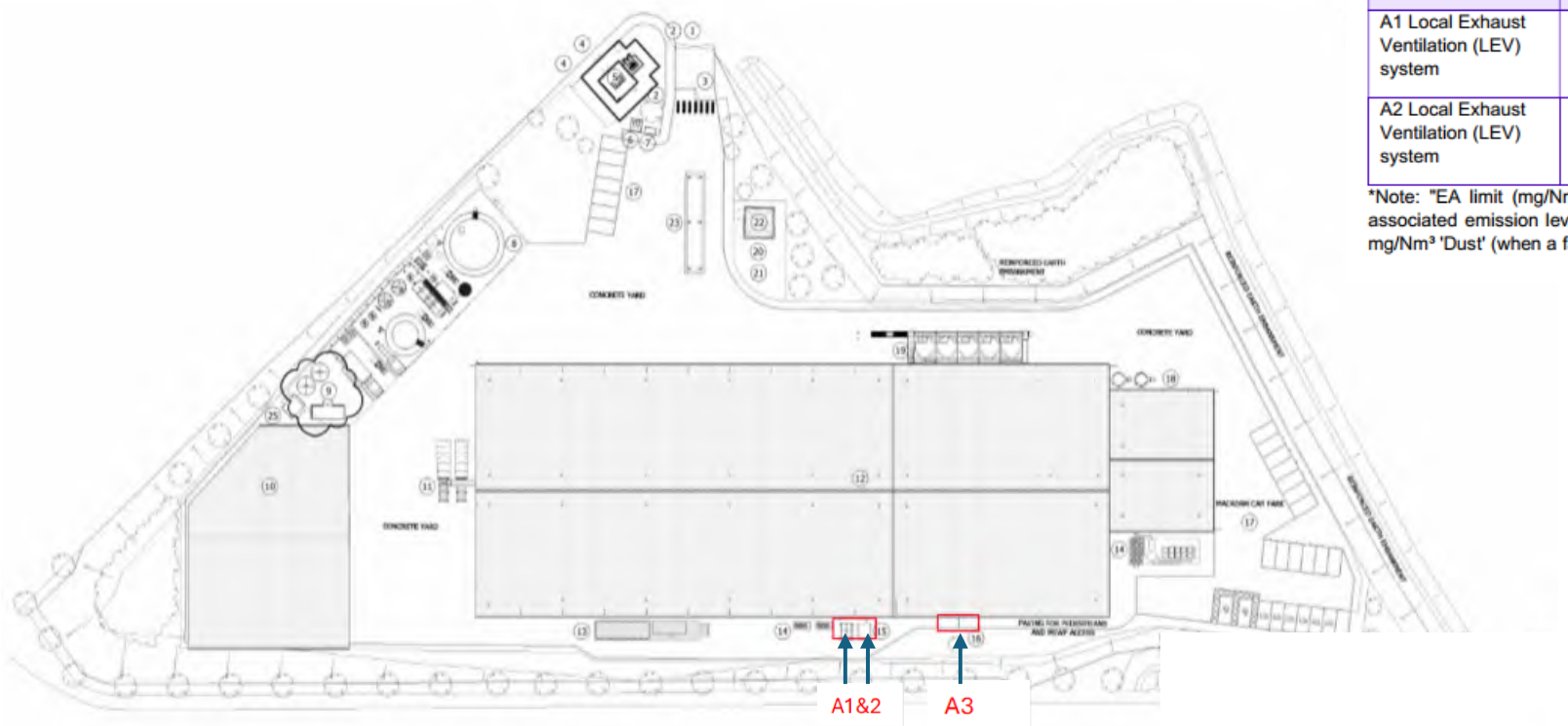
	Chemical Name / Description	Max volume @ position 1 (bulk storage) (l)	Max volume @ position 2 (chemical store) (l)	Max volume @ position 3 (wash line dosing) (l)	Max volume @ position 4 (WWTP bulk storage) (l)	Max volume @ position 5 (WWTP dosing IBCs)) (l)
Wash line Sorema	Caustic Soda 32%	12,000		1,000		
Wash line Sorema	RP34 (detergent)		2,000	1,000		
Wash line Sorema	MASTER S4 (wetting agent & foam control)		5,000	1,000		
Wash line Sorema	ANS TH (anti foam)		1,000	1,000		
Water treatment (Genco)	Sulphuric acid 15 - 51%			0	5,000	
Water treatment (Genco)	Polyaluminium chloride hydroxide			0	5,000	
Water treatment (Genco)	ACTIPOL DAM 3C5 (flocculant)		2,000			2,000
Water treatment (Genco)	Nutromex Plus 234a (Biological Nutriants)		2,000			2,000

Appendix D – Emissions to Air

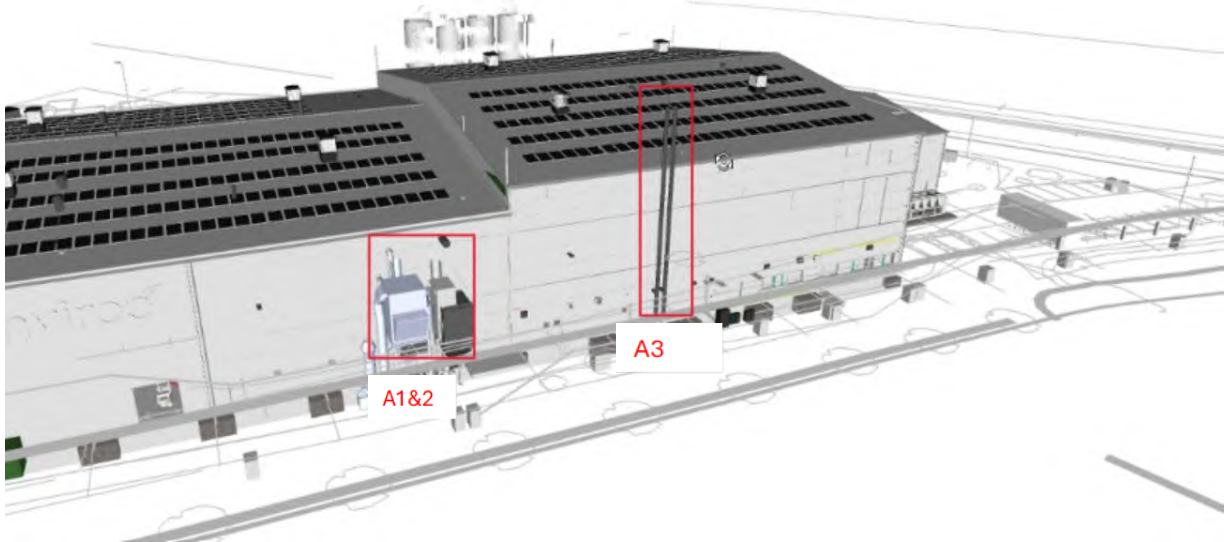
Table 9 Point source emissions to air

Emission Point Reference	Source	Parameter	Emission Limit	Monitoring Frequency	Monitoring Standard
A1 Local Exhaust Ventilation (LEV) system	Dust Abatement Plant 1	Particulates	10 mg/m^{3*}	Once every year	EN 13284-1
A2 Local Exhaust Ventilation (LEV) system	Dust Abatement Plant 2	Particulates	10 mg/m^{3*}	Once every year	EN 13284-1

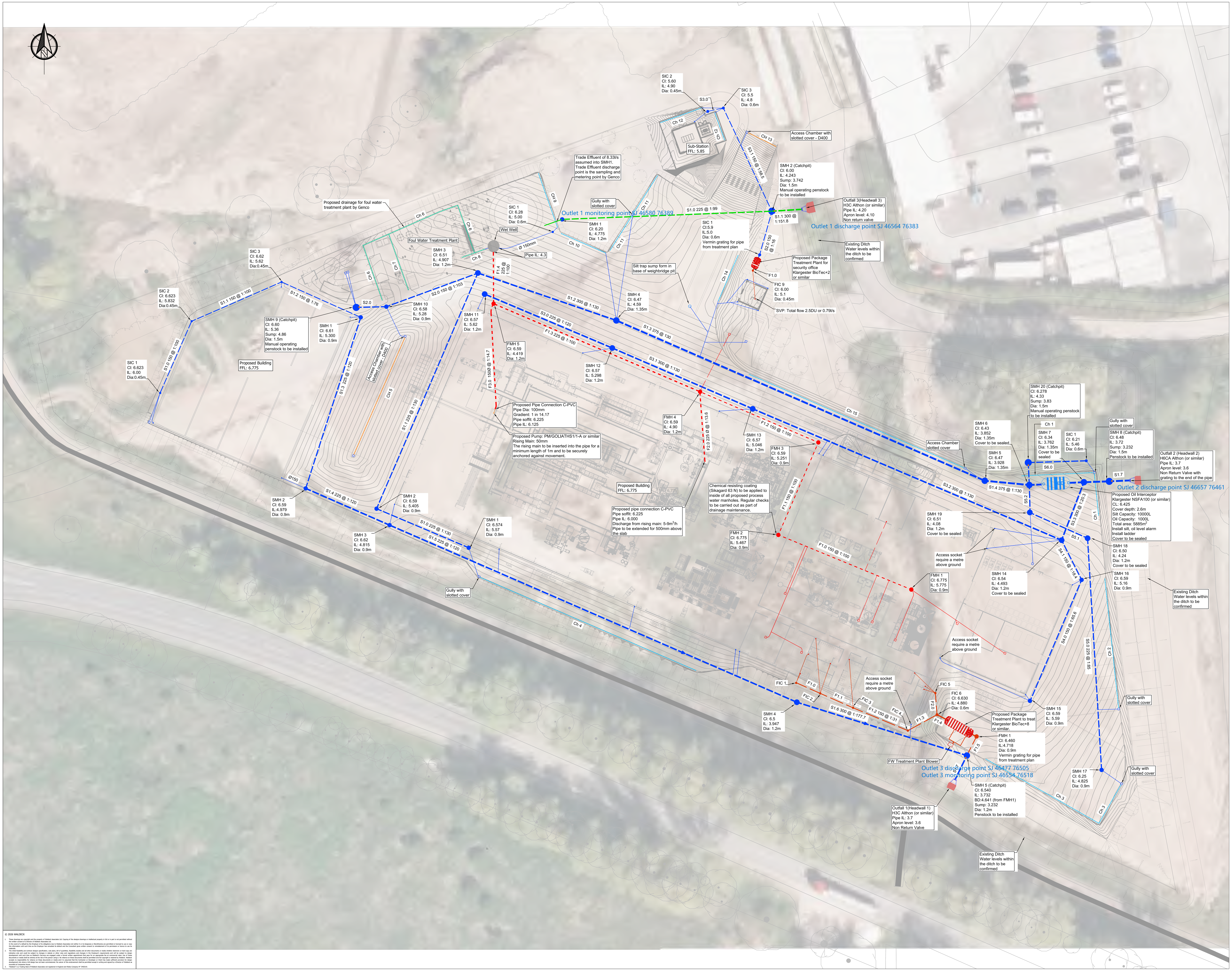
*Note: "EA limit (mg/Nm³) <10 mg/Nm³ (baghouse or cartridge filter) / EU BREF 'waste treatment' Table 6.3: BAT-associated emission level (BAT-AEL) for channelled dust emissions to air from the mechanical treatment of waste 2-5 mg/Nm³ 'Dust' (when a fabric filter is not applicable, the upper end of the range is 10 mg/Nm³).



The emission to air locations for the dust filter exhausts are marked up in the below drawing as A1&2. The boilers are marked up in the below drawing as A3 for reference only (MCPD does not apply).



Appendix E – Emissions to Water



SIC 2 CI: 5.60 IL: 4.90 Dia: 0.45m
SIC 3 CI: 5.5 IL: 4.8 Dia: 0.6m
S3.0
Ch 12
Ch 13
Sub-Station FFL: 5.85
Access Chamber with slotted cover - D400
S3.1 150 @ 1:98.5
SMH 2 (Catchpit) CI: 6.00 IL: 4.243 Sump: 3.742 Dia: 1.5m Manual operating penstock to be installed
Outfall 3(Headwall 3) H3C Althon (or similar) Pipe IL: 4.20 Apron level: 4.10 Non return valve
Outlet 1 discharge point SJ 46564 76383
Trade Effluent of 8.33l/s assumed into SMH1. Trade Effluent discharge point is the sampling and metering point by Genco
Gully with slotted cover
Outlet 1 monitoring point SJ 46580 76389
S1.0 225 @ 1:99
S1.1 300 @ 1:151.8
SIC 1 CI: 6.28 IL: 5.00 Dia: 0.6m
SMH 1 CI: 6.20 IL: 4.775 Dia: 1.2m
SIC 1 CI:5.9 IL:5.0 Dia: 0.6m Vermin grating for pipe from treatment plan
Existing Ditch Water levels within the ditch to be confirmed
Proposed Package Treatment Plant for security office Klargester BioTec+2 or similar
F1.0
FIC 9 CI: 6.00 IL: 5.1 Dia: 0.45m
SVP: Total flow 2.5DU or 0.79l/s
Silt trap sump form in base of weighbridge pit
Proposed drainage for foul water treatment plant by Genco
Wet Well
Foul Water Treatment Plant
Ø 150mm
Pipe IL: 4.3
SMH 3 CI: 6.51 IL: 4.907 Dia: 1.2m
SIC 3 CI: 6.62 IL: 5.62 Dia:0.45m
SIC 2 CI: 6.623 IL: 5.832 Dia:0.45m
S1.1 150 @ 1:100
S1.2 150 @ 1:76
S2.0
S2.0 150 @ 1:103
SMH 10 CI: 6.58 IL: 5.28 Dia: 0.9m
SMH 9 (Catchpit) CI: 6.60 IL: 5.36 Sump: 4.86 Dia: 1.5m Manual operating penstock to be installed
SMH 1 CI: 6.61 IL: 5.300 Dia: 0.9m
SIC 1 CI: 6.623 IL: 6.00 Dia:0.45m
S1.0 150 @ 1:100
Proposed Building FFL: 6.775
S1.3 225 @ 1:120
Access Chamber with slotted cover - D400
SMH 11 CI: 6.57 IL: 5.62 Dia: 1.2m
S1.2 300 @ 1:130
SMH 4 CI: 6.47 IL: 4.59 Dia: 1.35m
S3.0 225 @ 1:120
F1.3 225 @ 1:100
S1.3 375 @ 130
FMH 5 CI: 6.59 IL: 4.419 Dia: 1.2m
F3.0 150 @ 1:14.7
SMH 12 CI: 6.57 IL: 5.298 Dia: 1.2m
S3.1 300 @ 1:130
Proposed Pipe Connection C-PVC Pipe Dia: 100mm Gradient: 1 in 14.17 Pipe soffit: 6.225 Pipe IL: 6.125
Proposed Pump: PM/GOLIATHS1/1-A or similar Rising Main: 50mm The rising main to be inserted into the pipe for a minimum length of 1m and to be securely anchored against movement.
FMH 4 CI: 6.59 IL: 4.90 Dia: 1.2m
F2.0 225 @ 1:13.6
SMH 13 CI: 6.57 IL: 5.046 Dia: 1.2m
F1.2 150 @ 1:100
FMH 3 CI: 6.59 IL: 5.251 Dia: 0.9m
Ch 15
S1.5 225 @ 1:130
Ø150
SMH 2 CI: 6.59 IL: 4.979 Dia: 0.9m
S1.4 225 @ 1:120
SMH 2 CI: 6.59 IL: 5.405 Dia: 0.9m
SMH 3 CI: 6.62 IL: 4.815 Dia: 0.9m
S1.0 225 @ 1:130
S1.5 225 @ 1:120
SMH 1 CI: 6.574 IL: 5.57 Dia: 0.9m
Proposed Building FFL: 6.775
Proposed pipe connection C-PVC Pipe soffit: 6.225 Pipe IL: 6.000 Discharge from rising main: 5.9m³/h Pipe to be extended for 500mm above the slab
Chemical resisting coating (Sikagard 63 N) to be applied to inside of all proposed process water manholes. Regular checks to be carried out as part of drainage maintenance.
F1.1 150 @ 1:100
FMH 2 CI: 6.775 IL: 5.467 Dia: 0.9m
F1.0 150 @ 1:100
Gully with slotted cover
Ch 4
SMH 20 (Catchpit) CI: 6.278 IL: 4.33 Sump: 3.83 Dia: 1.5m Manual operating penstock to be installed
SMH 6 CI: 6.43 IL: 3.852 Dia: 1.35m Cover to be sealed
Access Chamber slotted cover
SMH 5 CI: 6.47 IL: 3.928 Dia: 1.35m
SMH 7 CI: 6.34 IL: 3.762 Dia: 1.35m Cover to be sealed
SIC 1 CI: 6.21 IL: 5.46 Dia: 0.6m
Gully with slotted cover
SMH 8 (Catchpit) CI: 6.48 IL: 3.72 Sump: 3.232 Dia: 1.5m Penstock to be installed
Outfall 2 (Headwall 2) H6CA Althon (or similar) Pipe IL: 3.7 Apron level: 3.6 Non Return Valve with grating to the end of the pipe
S1.7
S6.0
Outlet 2 discharge point SJ 46657 76461
S3.2 300 @ 1:130
S1.4 375 @ 1:130
Proposed Oil Interceptor Klargester NSFA100 (or similar) CL: 6.425 Cover depth: 2.6m Silt Capacity: 10000L Oil Capacity: 1000L Total area: 5885m² Install silt, oil level alarm Install ladder Cover to be sealed
S3.3 300 @ 1:30.3
SMH 19 CI: 6.51 IL: 4.08 Dia: 1.2m Cover to be sealed
S5.1
SMH 18 CI: 6.50 IL: 4.24 Dia: 1.2m Cover to be sealed
Access socket require a metre above ground
S4.1 150 @ 1:18.4
FMH 1 CI: 6.775 IL: 5.775 Dia: 0.9m
SMH 14 CI: 6.54 IL: 4.493 Dia: 1.2m Cover to be sealed
SMH 16 CI: 6.59 IL: 5.16 Dia: 0.9m
Existing Ditch Water levels within the ditch to be confirmed
S4.0 150 @ 1:56.6
S5.0 225 @ 1:85
Ch 2
Access socket require a metre above ground
Access socket require a metre above ground
FIC 1
FIC 2
FIC 3
FIC 4
FIC 5
FIC 6 CI: 6.630 IL: 4.880 Dia: 0.6m
S1.6 300 @ 1:177.7
F1.2 150 @ 1:31
SMH 4 CI: 6.5 IL: 3.947 Dia: 1.2m
Proposed Package Treatment Plant to treat Klargester BioTec+8 or similar
FMH 1 CI: 6.460 IL: 4.718 Dia: 0.9m Vermin grating for pipe from treatment plan
SMH 15 CI: 6.59 IL: 5.59 Dia: 0.9m
Gully with slotted cover
FW Treatment Plant Blower
Outlet 3 discharge point SJ 46477 76505
Outlet 3 monitoring point SJ 46554 76518
SMH 5 (Catchpit) CI: 6.540 IL: 3.732 Sump: 3.232 BD:4.641 (from FMH1) Dia: 1.2m Penstock to be installed
SMH 17 CI: 6.25 IL: 4.825 Dia: 0.9m
Gully with slotted cover
Ch 3
Outfall 1(Headwall 1) H3C Althon (or similar) Pipe IL: 3.7 Apron level: 3.6 Non Return Valve
Existing Ditch Water levels within the ditch to be confirmed
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